GEOLOGICAL SURVEY OF CANADA
BULLETIN 537

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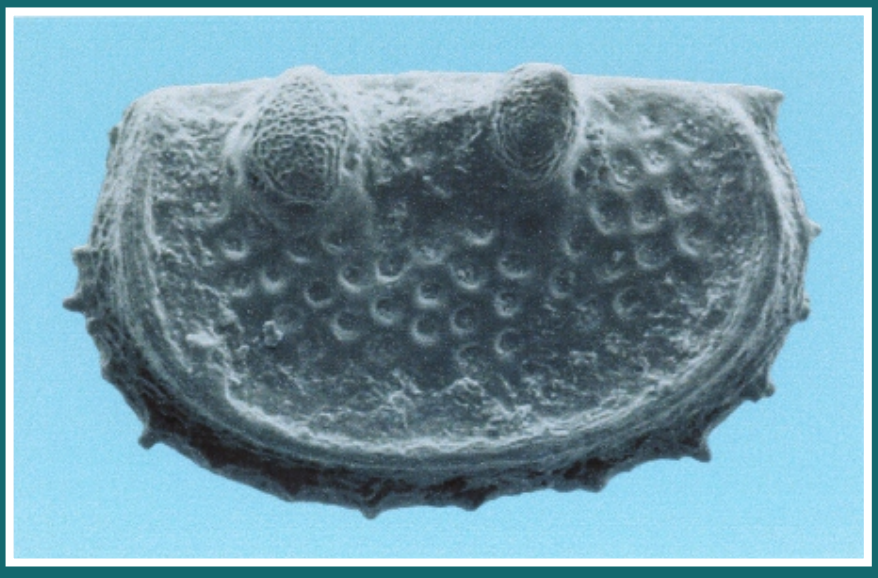
M.J. Copeland



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Cover Illustration
Ulrichia spinifera Coryell and Malkin
Left valve, carapace, Bell Formation (see Pl. 3, fig. 18)

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PREFACE

This report describes the late Middle Devonian ostracodes in two selected diamond drill cores from Lambton County, southwestern Ontario. This area, situated on the northeastern margin of the Michigan Basin, has the lithologies and ostracode fauna typical of other similarly aged strata of the Michigan Basin, and permits correlation across an area extending from southwestern Ontario, western New York, northern Ohio, and the southern peninsula of Michigan. The ostracode fauna are another criterion by which the age and economic potential of these strata may be assessed.

M.D. Everell
Assistant Deputy Minister
Earth Sciences Sector

PRÉFACE

On décrit dans ce rapport les ostracodes du Dévonien moyen tardif dans deux carottes choisies de forages au diamant provenant du comté de Lambton dans le sud-ouest de l'Ontario. Cette région, située à la bordure nord-est du bassin du Michigan, présente des types lithologiques et des ostracodes caractéristiques d'autres strates d'un âge analogue du bassin du Michigan et qui permettent d'établir des corrélations au sein d'une région couvrant le sud-ouest de l'Ontario, l'ouest de l'État de New York, le nord de l'État de l'Ohio et la partie sud de la péninsule du Michigan. Les ostracodes constituent un autre critère permettant d'évaluer l'âge et le potentiel économique de ces strates.

M.D. Everell
Sous-ministre adjoint
Secteur des sciences de la Terre

CONTENTS

Falsipollex valgus
Falsipollex sp.
Family Hollinellidae
Genus *Hollinella* (*Keslingella*)
Hollinella (*K.*) *pumila*
Genus *Labrosavelum*
Labrosavelum sphaericum
Family Amphissellidae
Genus *Doraclatum*
Doraclatum conatum
Genus *Dirhabdus*
Dirhabdus multicostatus
Family Arcyzonidae
Genus *Arcyzona homalosagenota*
Arcyzona sp.
Family Scrobiculidae
Genus *Scrobicula*
Scrobicula concentrica
Family Aparchitidae
Genus *Ehlersia*
Ehlersia hypercala
Family Coelonellidae
Genus *Coelonella*
Coelonella scapha
Family Kloedenellidae
Genus *Dizygopleura*
Dizygopleura euglyphea
Dizygopleura trisinuata
Genus *Poloniella*
Poloniella cingulata
Poloniella sp.?
Genus *Eukloedenella*
Eukloedenella doverensis
Genus *Punctoprimitia*
Punctoprimitia simplex
Punctoprimitia punctata
Family Geisinidae
Genus *Hypotetragona*
Hypotetragona fractodorsalis
Hypotetragona harrietensis
Order Eridostraca
Family Eridoconchidae
Genus *Cryptophyllus*
Cryptophyllus arsinius
Cryptophyllus minusculus?
Cryptophyllus sp.
Order Popocopida
Family Bairdiidae
Genus *Rectobairdia*
Rectobairdia emaciata
Genus *Acratia*
Acratia simplex
Family Beecherellidae
Genus *Pronipantex*
Pronipantex planus
Genus *Wideneria*

Figures

Tables

Plates 1 to 16

MIDDLE DEVONIAN (GIVETIAN, HAMILTON GROUP) OSTRACODA IN TWO DIAMOND DRILL CORES FROM LAMBTON COUNTY, SOUTHWESTERN ONTARIO

Abstract

Analysis of some five hundred ostracode-bearing samples in two diamond drill cores (GSC DD1 Arkona and GSC DD2 Ipperwash) from Bosanquet Township, Lambton County permits more exact understanding of the stratigraphic distribution of Ostracoda in the Middle Devonian (Givetian) Hamilton Group of southwestern Ontario. This allows more precise age determination and stratigraphic correlation of late Middle Devonian Ostracoda in southern Ontario with Middle Devonian ostracode faunas of the Michigan Basin and borderlands in central North America.

The ostracode fauna of the Hamilton Group in these drill cores, contained within the Bell, Rockport Quarry, Arkona, Hungry Hollow, and Widder formations and, in GSC DD2, part of the overlying Ipperwash Formation, comprises some 50 genera represented by almost twice that number of species. These are, with few exceptions, synonymous with ostracode faunas previously reported from elsewhere in the Michigan Basin. The palaeocopid ostracode fauna is dominated by species of the suborders Beyrichicopina and Kloedenellocopina and the podocopid ostracode fauna is represented by species of the suborders Podocopina and Metacopina. There are no leperditicopids.

This Hamilton Group ostracode assemblage is of latest Middle Devonian age and may be equated, in part, with similar faunas of the Silica Formation of southeastern Michigan–northwestern Ohio, the Traverse Group of the northern part of the lower peninsula of Michigan, and Middle Devonian faunas of western New York State. The Hamilton Group ostracodes from southwestern Ontario appear to have evolved during a period of relatively stable environmental conditions and represent lineages of continuous faunal development.

Résumé

L’analyse de quelque 500 échantillons renfermant des ostracodes, tirés de deux carottes de forages au diamant (GSC DD1 Arkona et GSC DD2 Ipperwash) exécutés dans le canton de Bosanquet du comté de Lambton, permet de mieux comprendre la répartition stratigraphique des ostracodes dans le Groupe de Hamilton du Dévonien moyen (Givétien) dans le sud-ouest de l’Ontario. Elle permet de plus précises déterminations des âges et des corrélations stratigraphiques entre les ostracodes du Dévonien moyen tardif dans le sud de l’Ontario et ceux du Dévonien moyen dans le bassin du Michigan et les régions frontalières du centre de l’Amérique du Nord.

Les ostracodes trouvés dans les formations de Bell, de Rockport Quarry, d’Arkona, de Hungry Hollow et de Widder du Groupe de Hamilton dans ces carottes et, dans le cas de l’échantillon GSC DD2, dans une partie de la formation sus-jacente d’Ipperwash, comprennent quelque 50 genres regroupant près de 100 espèces. À quelques exceptions près, ces espèces sont les mêmes que celles qui ont été reconnues antérieurement ailleurs dans le bassin du Michigan. Les ostracodes paléocopidés comprennent principalement des espèces des sous-ordres Beyrichicopina et Kloedenellocopina, tandis que les ostracodes podocopidés sont représentés par des espèces des sous-ordres Podocopina et Metacopina. Il n’y a pas de leperditicopidés.

Cet assemblage d’ostracodes du Groupe de Hamilton date du Dévonien moyen sommital et peut être en partie assimilé à des assemblages similaires de la Formation de Silica du sud-est du Michigan et du nord-ouest de l’Ohio et du Groupe de Traverse de la partie nord de la basse péninsule du Michigan, et à des assemblages du Dévonien moyen de la partie ouest de l’État de New York. Les ostracodes du Groupe de Hamilton provenant du sud-ouest de l’Ontario auraient évolué pendant une période de temps marquée par des conditions environnementales relativement stables et représentent des lignées au développement faunique ininterrompu.

INTRODUCTION

In the late 1960s the Geological Survey of Canada authorized the drilling of two diamond drill cores in Bosanquet Township, Lambton County, Ontario (Fig. 1, 2). These wells, known as GSC DD1 (Arkona) and GSC DD2 (Ipperwash), were drilled to depths of 110 m (361 ft.) and 130 m (426 ft.) respectively, in order to determine the lithology and thickness of some Middle Devonian strata along the southern shore of Lake Huron on the northern flank of the Algonquin Arch. The holes penetrated strata of the Hamilton Group and the underlying Dundee Formation, and bottomed out in the Lucas Formation of the Detroit River Group, all of Middle Devonian age. The thickness of the Givetian Hamilton Group in GSC DD1 was 76.58 m, and that of GSC DD2 was 94.24 m (Fig. 3). The cores were logged by B.V. Sanford, who was in charge of the operation (his terminology for strata of the Hamilton Group is shown in the column for southwestern Ontario of Figure 3, and in Figure 4. His descriptive logs of the Hamilton Group and upper part of the underlying Dundee Formation strata are contained in Legault (1973, p. 68-71). Descriptions of the megafauna from these cores have yet to be published but the Chitinozoa and Acritarcha were described in Legault (1973) and the Ostracoda in the present paper. This report contains information mostly from the shale part of the Hamilton Group (areas of dashed lines on Fig. 4) from which the microfossils were readily extracted. There are microfaunal remains in the thinner limestone sequences (areas of horizontal and vertical lines on Fig. 4) but they are commonly fragmented or distorted on the broken core surfaces.

The shale parts of the cores, sampled at 0.305 m (1 ft.) intervals, were readily disintegrated in warm water. The ostracodes were retrieved using fine sieves and rewashed several times to remove as much adhering sediment as possible. Many thousands of individuals were collected and examined during the ensuing years. In general, the specimens are well preserved as carapaces (though not in as unique a state of preservation as the Silica Formation specimens described by Kesling and Chilman, 1978, 1987). There is some evidence of breakage and abrasion so it is probable that some transportation of specimens occurred before burial.

OSTRACODE FAUNAS OF THE MICHIGAN BASIN AND BORDERLANDS

Much has been written about the Middle Devonian Ostracoda of this general area since Hall (1860) described the first ostracode species as *Leperditia punctulifera* Hall from western New York State. Kesling and Chilman (1978,

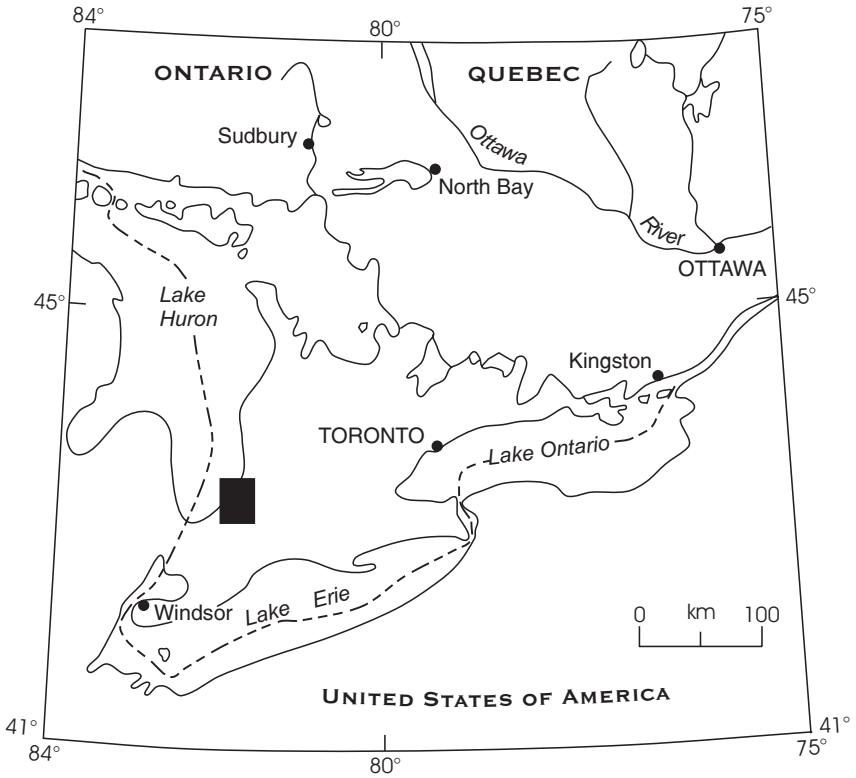

Figure 1. *Southern Ontario and parts of western Québec and northern United States. The area shown in Figure 2 is indicated by black rectangle.*

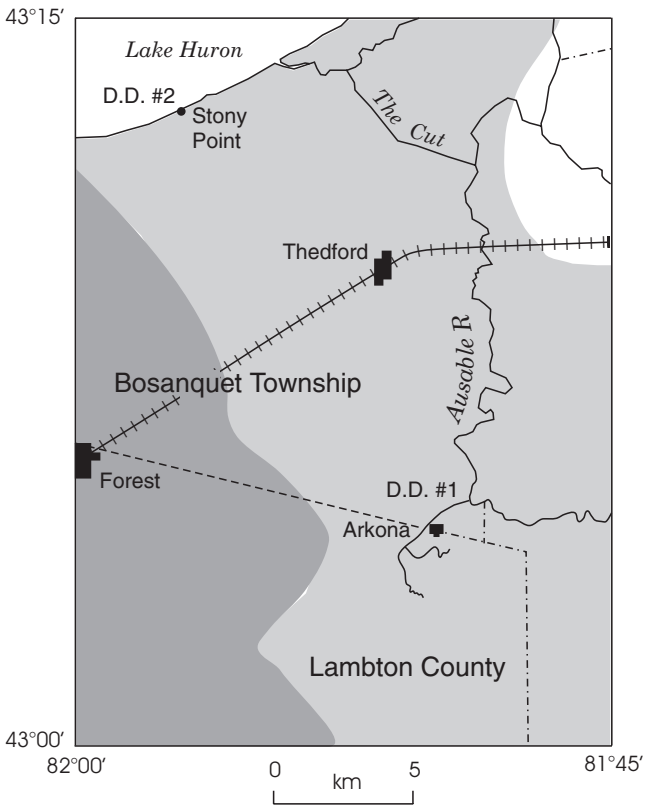

Figure 2. *The northeastern part of Bosanquet Township, Lambton County, Ontario showing the localities of GSC DD1 (Arkona) and GSC DD2 (Ipperwash). Stratigraphy, in ascending order, is shown as white (Dundee Formation), light grey (Hamilton Group) and dark grey (Kettle Point Formation).*

1987) present excellent diagrams, photographs and bibliographies of Middle Devonian ostracode occurrences throughout the Michigan Basin and borderlands from the northern area of the lower peninsula of Michigan, southeastern Michigan, northwestern Ohio, western New York, and southwestern Ontario. Other reports of Middle Devonian Ostracoda from southwestern Ontario are those by Nicholson (1874), Jones (1889, 1890a, b, 1891), Whiteaves (1889, 1898), Stauffer (1915), Coryell and Malkin (1936), Turner (1939), Kesling (1953a, b, c), Coley (1954), Peterson (1964, 1966) and Melik (1966), as well as unpublished theses prepared under the supervision of R.V. Kesling of the University of Michigan, Ann Arbor, Michigan. Fritz (1939) recognized an "Upper Ostracode Zone" (i.e. Hamilton Group) in several wells drilled southwest of the present occurrences in southwestern Ontario between Lake Erie and Lake St. Clair. Stumm and Wright (1958), in their checklist of fossil invertebrates from the Middle Devonian rocks of the Thedford–Arkona, Ontario region, recorded all Ostracoda previously reported. Winder (1967, p. 714) presented a generalized account of the occurrence of Ostracoda in this area.

OSTRACODE BIOSTRATIGRAPHY OF THE HAMILTON GROUP

From the cores drilled in southwestern Ontario, Sanford (1967) subdivided the Hamilton Group into, in ascending order, the Bell, Rockport Quarry, Arkona, Hungry Hollow, Widder and Ipperwash formations, and correlated them with most of the Traverse Group of the northern part of the lower peninsula of Michigan (Fig. 3). Kesling and Chilman (1978, 1987) recognized only the Arkona to Ipperwash formations in southwestern Ontario, and included Sanford's Bell, Rockport Quarry and Arkona designations in their Arkona Formation. They, therefore, equated all of their Arkona Formation of southwestern Ontario to the Silica Shale of northwestern Ohio and southeastern Michigan. Accordingly, the stratigraphic distribution of their Arkona species is not readily ascertainable within the Bell, Rockport Quarry and Arkona subdivisions of Sanford, which are followed in the report by Legault (1973) and herein. As a result, Kesling and Chilman (1978) recorded 65 species of Ostracoda from their Arkona Formation of southwestern Ontario and the same authors (1987) recorded 19 (11 previously unrecorded from this formation) dimorphic species. In all, the total number of ostracode species recognized by those authors in 1978 and 1987 from their Arkona Formation was 76. Kesling and Chilman (1978) also recorded 42 ostracode species from the Hungry Hollow Formation, 58 species from the Widder Formation and 35 species from the Ipperwash Formation of southwestern Ontario. In 1987 these authors recognized four additional species from the Hungry Hollow Formation and five from the Ipperwash Formation. In all, more than 110 ostracode species are reported from the Hamilton Group of southwestern Ontario, making this fauna one of the most diverse Paleozoic assemblages recorded in North America.

The ostracode fauna in the two cores discussed herein appears to remain substantially uniform in composition throughout the Hamilton Group. This is probably the result of a relatively stable environment of deposition. Kesling and Chilman (1978, p. 150) postulated that the Silica ostracode fauna evolved in the northern part of the lower peninsula of Michigan and migrated south, where they occur in the Silica Formation stratigraphic interval of northwestern Ohio. They contended that there is a much stronger faunal tie between these areas than with the fauna of the lower part of the Hamilton Group of Ontario. Only after deposition of the Silica Formation did these ostracode faunas invade the western New York area, possibly by direct migration, and then occupied the same type of post-Silica environment during deposition of the upper Hamilton Group of Ontario (i.e., Hungry Hollow to Ipperwash interval). The faunal charts (Fig. 5, 6) show the stratigraphic distribution of ostracodes in the two cores from the Thetford–Arkona region of southwestern Ontario. The charts indicate some faunal migration after Arkona deposition but apparently not as great as that anticipated by Kesling and Chilman. Of

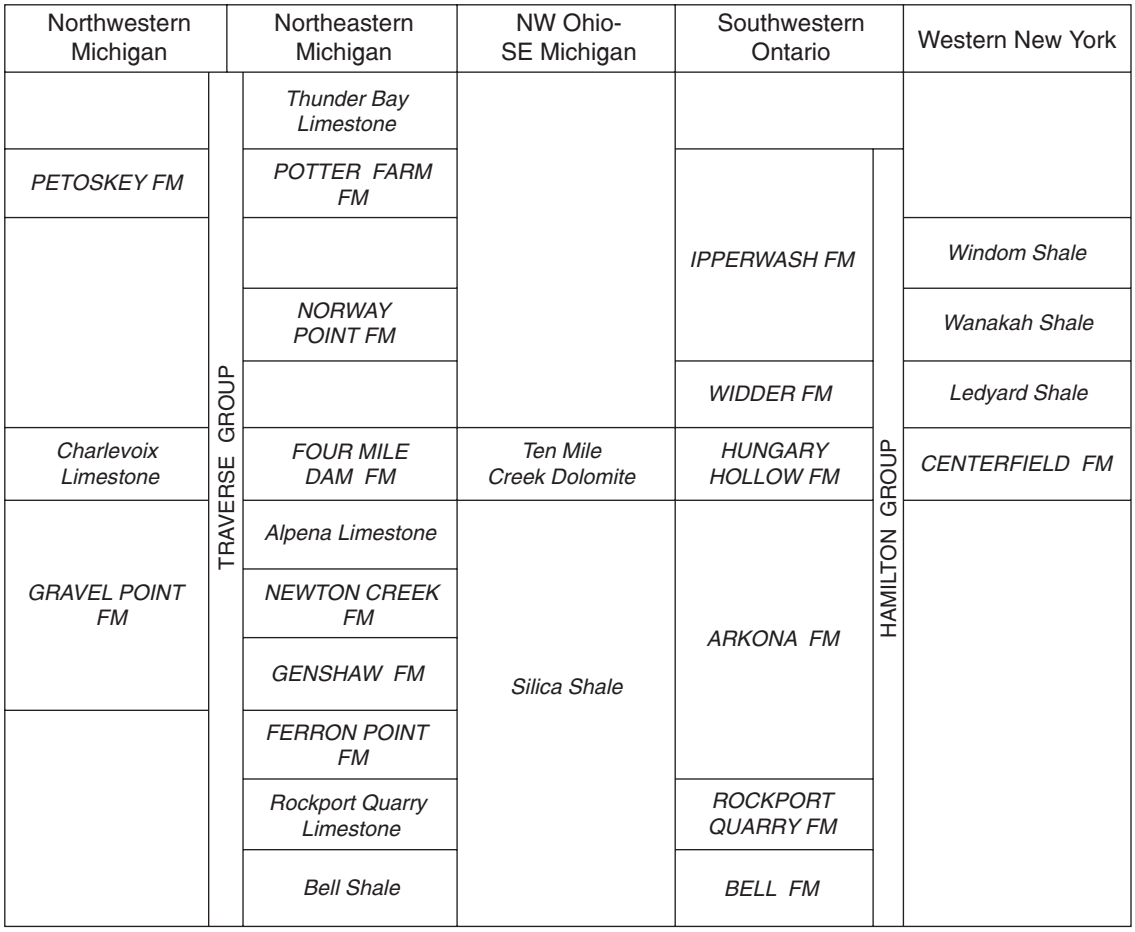

Figure 3. *Middle Devonian ostracode-bearing formations in the Great Lakes area correlative with the Hamilton Group of southwestern Ontario. (Adapted from Kesling and Chilman, 1987, figure 3; terminology for southwestern Ontario follows that of Sanford, 1967, figure 3).*

course, this could be better ascertained by studying the ostracode fauna from a large number of localities in southwestern Ontario.

Because of the lithology in which the ostracodes are found it is obvious they preferred a soft mud substrate below the level of turbulence. As Kesling and Chilman (1978, 1987) pointed out, the preference for this type of environment caused migration during times of sea-level fluctuation to maintain a favourable habitat. This resulted in the establishment of many species that are long ranging through the Hamilton Group.

Representative of these long-ranging species are *Quasillites concentricus*, *Ponderodictya punctulifera*, *Cytherellina lucasensis* and *Ulrichia fragilis* to name a few. Kesling and Chilman (1978), therefore, postulated that the southwestern Ontario site of deposition of the Silica Shale may have been an area of somewhat deeper water than during subsequent deposition. This area became a more favourable habitat of shallower water for many species during post-Silica deposition into which many of the Silica species migrated. These species are long-ranging and facies controlled, not good time indicators.

There are, however, some species represented by relatively numerous specimens in the two southwestern Ontario cores that are not long ranging. For example, *Balantoides trilobata* does not occur above the Arkona Formation, species of *Cryptophyllus* occur only in the Bell and Rockport Quarry formations, *Hypotetragona harrietensis* only in the Bell and lower few metres of the Arkona formations and *Menoeidina scopeli* only in the Widder Formation. There are also a number of species in both cores that are represented by so few specimens that they appear to be of no particular stratigraphic importance.

Figures 5 and 6 illustrate the distribution of species within the two cores. The species listed at the top of each figure represent the youngest stratigraphic occurrence from left to right. This permits rapid evaluation of ostracode occurrences and extinctions throughout the Hamilton Group. The depths from which the ostracode species were collected, as listed, are arbitrary, but the top of each formation is indicated. The

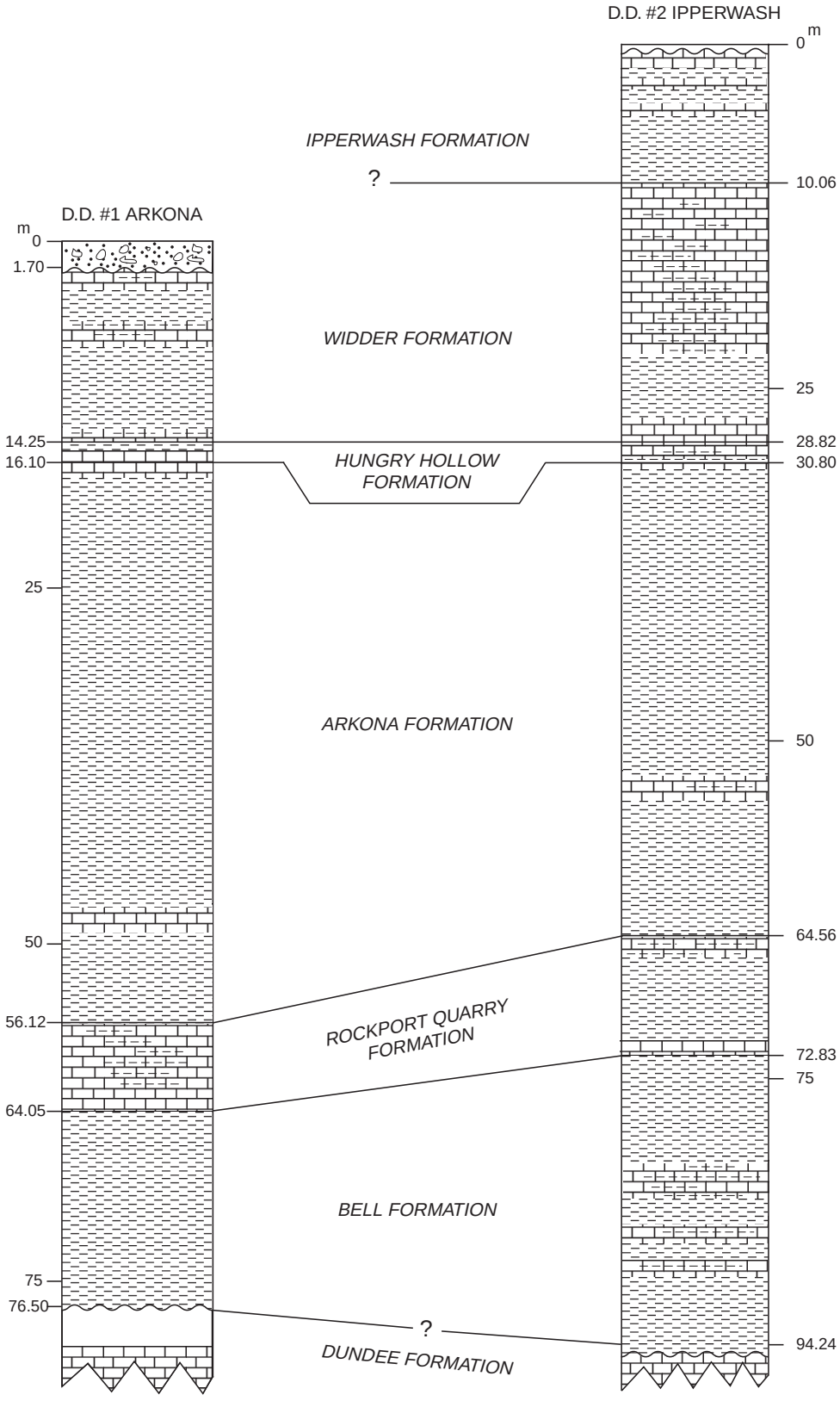

Figure 4. *Stratigraphic sections of GSC DD1 and GSC DD2 as established by B.V. Sanford. Only the Hamilton Group strata and uppermost beds of the underlying Dundee Formation of these drill cores are shown. (For written descriptions of these cores see Legault, 1973, p. 68-71.)*

exact positions of the specimens figured are given in the plate descriptions.

Data from Figures 5 and 6 were used to derive the information illustrated in Tables 1 and 2. The number of ostracode taxa found in the Hungry Hollow Formation of GSC DD1 is substantially less than that of GSC DD2 (7 as against 26) because of the difference in lithologies. It is more difficult to interpret the difference in the number of taxa restricted to the Widder Formation in each of the two cores (2 as against 11) but it is possibly attributable to the fact that only the lower portion of that formation is present in GSC DD1 and a greater thickness is present in GSC DD 2. The Ipperwash Formation is not present in GSC DD1.

GROUP	FORMATION	DEPTH (m)	OSTRACODE SPECIES	*Ponderodictya punctulifera*	*Euglyphella sigmoidalis*	*Ulrichia spinifera*	*Ostracode* indet.	*Quasillites concentricus*	*Ulrichia fragilis*	*Cytherellina?* sp.	*Cytherellina lucasensis*	*Punctoprimitia simplex*	*Bufina abbreviata*	*Tetrasacculus bilobus*	*Menoeidina arcuata*	*Aechmina choanobasota*	*Ctenoloculina acanthina*	*Hollinella (K.) pumila*	*Punctoprimitia punctata*	*Arcyzona* sp.	*Ponderodictya* sp.	*Arcyzona homalosagenota*	*Stictobollia alethaae*	*Falsipollex valgus*	*Menoeidina paucipunctata*	*Wideneria lispa*	*Ctenoloculina cicatricosa*	*Kirkbyella (K.) bellipuncta*	*Jenningsina?* sp.	*Menoeidina scopeli*
HAMILTON	*WIDDER*	1.7 - 3.0		X	X	X	X																							
		3.0 - 6.0		X	X			X	X	X	X	X	X																	
		6.0 - 9.0		X		X		X	X	X	X			X	X	X	X	X	X	X	X	X	X	X	X	X				
		9.0 - 12.0		X		X	X	X	X	X		X		X	X	X	X	X	X								X	X	X	X
		12.0 - 14.25		X	X		X	X			X																	X			
	HH	14.25 - 16.1					X	X			X	X		X														X			
	ARKONA	16.1 - 20.0		X		X		X	X	X	X	X		X	X	X	X	X			X							X	X		
		20.0 - 23.0		X				X	X		X	X	X	X	X	X	X											X			
		23.0 - 26.0		X				X			X	X										X						X			
		26.0 - 29.0		X	X		X	X			X							X			X							X			
		29.0 - 32.0		X			X	X	X		X	X	X		X	X					X		X					X			
		32.0 - 35.0		X	X		X	X	X		X	X			X		X	X				X		X					X		
		35.0 - 38.0		X		X	X	X			X				X																
		38.0 - 41.0		X	X	X		X			X	X			X		X					X						X			
		41.0 - 44.0		X	X	X		X	X	X	X	X		X	X		X						X		X			X		X	
		44.0 - 47.0		X		X		X		X	X	X		X	X							X						X			
		47.0 - 50.0		X	X	X	X	X		X	X	X		X	X			X						X	X	X					
		50.0 - 53.0		X		X		X	X	X	X				X		X									X		X			
		53.0 - 56.12		X	X			X			X	X			X					X?			X		X				X		
	RQ	56.12 - 60.0		X			X				X	X																			
		60.0 - 64.05		X	X	X	X	X			X	X			X																
	BELL	64.05 - 67.0		X		X	X	X	X		X				X					X				X							
		67.0 - 70.0		X				X			X				X									X							
		70.0 - 73.0		X	X	X		X			X	X	X		X						X				X						
		73.0 - 76.58		X	X			X		X	X	X						X			X				X	X	X				

Figure 5. *Stratigraphic distribution of Ostracoda in GSC DD1 (Arkona).*

Associated with the ostracodes, in microfossil residues, are miniature specimens of high- and low-spired gastropods, brachiopods, rare ammonites, spirorbid worms, scolecodonts, megaspores of *Tasmanites* type, conodonts, tentaculites, fragments of branching bryozoans, corals, and trilobites. Unlike the Silica Formation, there is very little pyritization of specimens or pyrite in the residues.

SYSTEMATIC PALEONTOLOGY

The synonymy for each species is abbreviated to two or three references; the original designation, that of Kesling and Chilman (1978) and, in the case of taxa of the palaeocopid Superfamilies Beyrichiacea, Primitiopsacea and Hollinacea, that of Kesling and Chilman (1987). All other references are contained in Kesling and Chilman (1978).

Phlyctiscapha apleta	*Dizygopleura trisinuata*	*Poloniella cingulata*	*Subligaculum calcaratum*	*Falsipollex lativelatus*	*Eukloedenella doverensis*	*Quasillites sublunatus*	*Quasillites fordei*	*Acratia simplex*	*Balantoides trilobata*	*Ulrichia fastidiosa*	*Praepilatina silicensis*	*Doraclatum conatum*	*Aechmina crenulata*	*Bufina?* sp.	*Ulrichia illinearis*	*Octonaria laevilitata*	*Ctenoloculina* n. sp.?	*Hypotetragona fractodorsalis*	*Octonaria quadricostata*	*Punctoprimitia punctata*	*Cornigella* n. sp.?	*Menoeidina subreniformis*	*Bairdiocypris transptyxis*	*Cytherellina subquadrata*	*Hypotetragona harrietensis*	*Ponderodictya ohioensis*	*Octonaria crescentiformis*	*Kirkbyella (K.)* sp. nov.?	*Dirhabdus multicostatus*	*Quasillites* n. sp.?	*Glyphella reticulata*	*Jenningsina catenulata*
X																																
	X																															
	X	X	X	X	X	X	X	X																								
	X	X	X	X					X																							
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	X					X			X						X	X			X	X	X											
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X	X			X	X	X	X		X						X		X		X			X	X									
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	X	X			X		X	X	X						X		X				X											
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Figure 5. *Continued.*

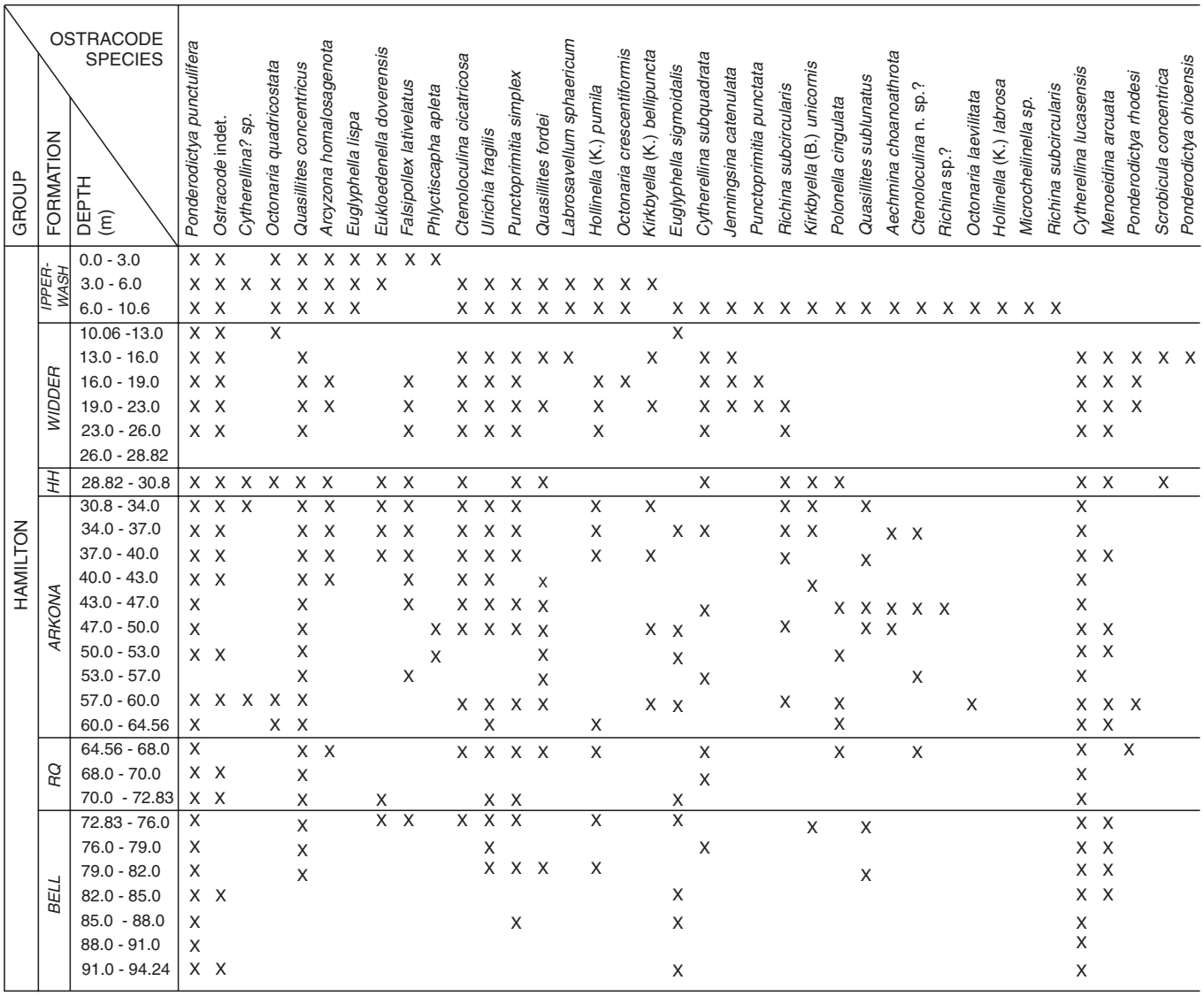

Figure 6. *Stratigraphic distribution of Ostracoda in GSC DD2 (Ipperwash).*

Table 1

Number of taxa recognized in each formation of the Hamilton Group during the present study

Formation	GSC DD1 (Arkona)	GSC DD2 (Ipperwash)
Ipperwash		32
Widder	28	45
Hungry Hollow	7	26
Arkona	51	54
Rockport Quarry	18	26
Bell	34	28

Table 2

Number of taxa apparently restricted to a single formation that were recognized during the present study

Formation	GSC DD1 (Arkona)	GSC DD2 (Ipperwash)
Ipperwash		3
Widder	2	11
Hungry Hollow		1
Arkona	11	12
Rockport Quarry		1
Bell	4	6

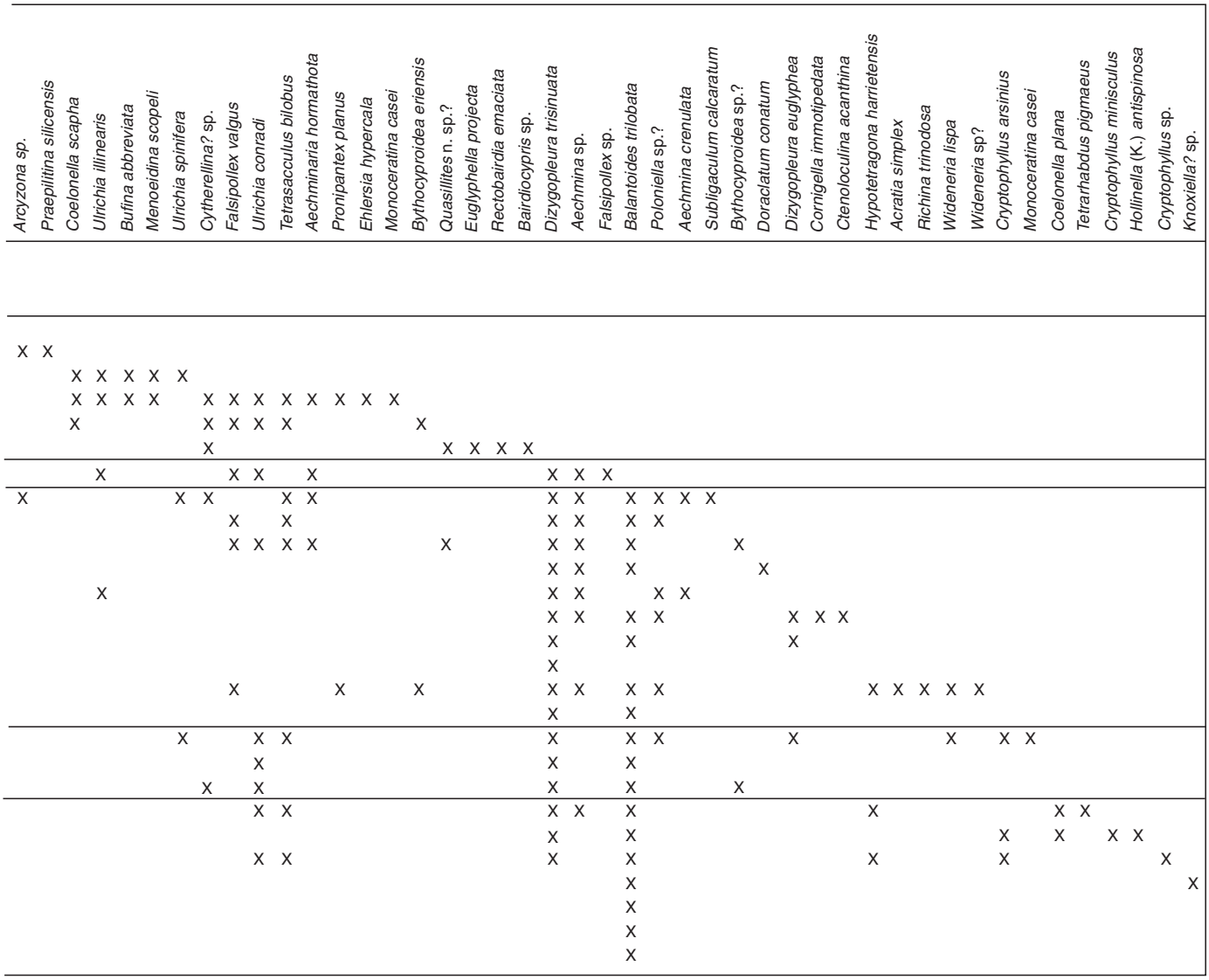

Figure 6. *Continued.*

Subclass OSTRACODA Latreille, 1806

Order PALAEOCOPIDA Henningsmoen, 1953

Suborder BEYRICHICOPINA Scott, 1961

Superfamily BEYRICHIACEA Matthew, 1886

Family BEYRICHIIDAE Matthew, 1886

Subfamily TREPOSELLINAE Henningsmoen, 1954

Genus *Phlyctiscapha* Kesling, 1953

Type species. Phlyctiscapha rockportensis Kesling, 1953.

Remarks. Unlike most beyrichiaceans, heteromorphic specimens of *Phlyctiscapha* species have a crumina distinguishable only anteriorly from the lateral surface of the valve but which blends smoothly into the domicilium posteriorly. Both dimorphs lack lobation and the velar structure in each is represented by a faint ridge. In these respects *Phlyctiscapha* is most reminiscent of *Saccarchites* Swartz and Whitmore 1953 from the Lower Devonian Manlius Limestone.

Phlyctiscapha apleta Kesling, 1954

Plate 1, figures 1-6

Phlyctiscapha apleta Kesling, 1954, p. 188-190; Pl. I, figs. 1-15; Kesling and Chilman, 1978, p. 40-43; Pl. 34, figs. 1-10; Pl. 35, figs. 1-11; Pl. 36, figs. 5-20; Pl. 37, figs. 1-20; Kesling and Chilman, 1987, p. 2; Pl. 64, figs. 1-5; Pl. 65, figs. 11-18; Pl. 66, fig. 17.

Description. The large adult size of this species tends to distinguish it from other species of the genus. The greatest height is slightly anterior of mid-valve, the greatest width posterior. Cardinal angles are ill-defined, slightly rounded to the short, slightly depressed hinge. The free margin is marked by a very low velar ridge and a broader, rounded marginal ridge. The anterior margin of the heteromorphic crumina is marked by a semisulcus and may be somewhat acuminate rather than evenly convex as in other species of the genus.

Type material. Hypotypes GSC 109944-109949.

Occurrence. Only a few specimens were found in the two cores. In GSC DD1 they occur in the Bell, Arkona and Widder formations, and in GSC DD2 in the Arkona and Ipperwash formations.

Remarks. Kesling and Chilman (1987) distinguished four species of *Phlyctiscapha* (*P. apleta*, *P. dubia*, *P. rockportensis* and *P. subovata*) from the Middle Devonian of the Great Lakes region. They reported only one species, *P. apleta* Kesling, from the Hungry Hollow and Widder formations of southwestern Ontario. During the present study *P. apleta* was also identified from the Bell, Arkona and Ipperwash formations.

Superfamily DREPANELLACEA Ulrich and Bassler, 1923

Family AECHMINELLIDAE Sohn, 1961

Genus *Balantoides* Morey, 1935

Type species. Balantoides quadrilobatus Morey, 1935.

Balantoides trilobata (Turner) 1939

Plate 1, figures 7-13

Boursella trilobata Turner, 1939, p. 14; Pl. 1, fig. 4.
Balantoides trilobata (Turner). Kesling and Chilman, 1978, p. 45; Pl. 89, figs. 21-55; Pl. 118, fig. 3.

Description. The species is fundamentally trilobate with a posterior extra lobate area. L2 and L3 may extend above the short, sunken hingeline. The cardinal angles are relatively distinct and there is no development of a velar structure. The valve surface is ornamented with faint to pronounced irregularly distributed pits, although in some examples the dorsal extremities of the lobes are smooth.

Type material. Hypotypes GSC 109950-109956.

Occurrence. This species comprises some of the smallest individuals in the collections. It is well represented in numerous collections in both GSC DD1 and GSC DD2 in the Bell, Rockport Quarry and Arkona formations, but does not occur above the Arkona Formation.

Family AECHMINIDAE Swartz, 1936

Genus *Aechmina* Jones and Holl, 1869

Type species. Aechmina cuspidata Jones and Holl, 1869.

Aechmina crenulata Stewart, 1937

Plate 1, figure 14

Aechmina serrata Stewart, 1936, p. 748; Pl. 100, figs. 21, 22.
Aechmina crenulata Stewart, 1937, p. 368.
Aechmina crenulata Stewart. Kesling and Chilman, 1978, p. 46; Pl. 10, figs. 1, 2; Pl. 11, figs. 1-6; Pl. 13, figs. 1-4; Pl. 108, fig. 6.

Description. None of the specimens from the present study has retained a complete dorsal spine. The otherwise unornamented valves usually bear a row of minute denticles or serrations around the free margin of the valves.

Type material. Hypotype GSC 109957.

Occurrence. Rockport Quarry and Arkona formations in GSC DD1 and Arkona Formation in GSC DD2.

Aechmina choanobasota Kesling, 1953

Plate 1, figures 15-17

Aechmina choanobasota Kesling, 1953, p. 29, 30; Pl. II, figs. 15-25; Pl. III, figs. 1-20.
Aechmina choanobasota Kesling. Kesling and Chilman, 1978, p. 46; Pl. 11, figs. 13, 14.

Description. This species is very similar to *A. crenulata* but adult specimens are usually larger and the dorsal spine is more robust. The specimens do not bear marginal denticles but may have minute striations along the free margin.

Type material. Hypotypes GSC 109958-109960.

Occurrence. Arkona and Widder formations in GSC DD1 and Arkona and Ipperwash formations in GSC DD2.

Aechmina sp.

Plate 1, figure 18

Description. Specimens are as long as they are wide, smooth and without marginal denticles. The dorsal spine projects laterally, has a broad base that may be ornamented with a scale-like pattern, and tapers rapidly to a small, spinose projection. The ornamentation may be likened to that of *A. phantastica* Kesling, 1953 but the specimens from the core are much more semicircular in lateral view.

Type material. Figured specimen GSC 109961.

Occurrence. Arkona Formation in GSC DD2.

Genus *Aechminaria* Coryell and Williamson, 1936

Type species. Aechminaria nodosa Coryell and Williamson, 1936.

Aechminaria hormathota Kesling, 1953

Plate 1, figures 19-22

Aechminaria hormathota Kesling, 1953, p. 5-7; Pl. I, figs. 21, 22, 24-29.
Aechminaria hormathota Kesling. Kesling and Chilman, 1978, p. 47; Pl. 11, figs. 17-22; Pl. 49, figs. 1-4.

Remarks. Kesling (1953c, p. 5-7) described this species in much detail. He reported his specimens as having a short S2 in front of the dorsal spine. The specimens from the core have a small pit anterior of the spine but there is no indication of a sulcal depression that would represent S2. Also, Kesling considered that a low node (L2) was present anterior of his S2; this not evident on our specimens.

Type material. Hypotypes GSC 109962-109965.

Occurrence. Arkona, Hungry Hollow and Widder formations in GSC DD2.

Family BOLLIIDAE Boucek, 1936

Genus *Cornigella* Warthin, 1930

Type species. Cornigella minuta Warthin, 1930.

Cornigella immotipedata Kesling, 1953

Plate 2, figures 1, 2

Cornigella immotipedata Kesling, 1953a, p. 200, 201; Pl. I, figs. 33-45.
Cornigella immotipedata Kesling. Kesling and Chilman, 1978, p. 47, 48; Pl. 38, figs. 10-33; Pl. 39, figs. 1-22; Pl. 109, figs. 4, 5.

Remarks. Kesling (1953a) described this species as having L1 and L4 as distinct ridges and L2 and L3 as dorsal nodes with discrete ventral nodes below L2 and L3. The specimens observed in this study that most closely conform to this description have all of these characteristics except that L1 is a node at mid-height of the valve, not a ridge. This slight variation might be expected in a species with so complex an ornamentation but gives rise to the question as to whether the anterior "ridge" or "node" and the posterior ridge (L4?) are portions of a disrupted admarginal structure. It is considered that the two ventral nodes are too high on the domicilium to be part of this hypothetical structure.

Type material. Hypotypes GSC 109966, 109967.

Occurrence. Only rare specimens were found in the Arkona Formation of both GSC DD1 and GSC DD2.

Cornigella n. sp.?

Plate 2, figures 3, 4

Description. This species is fundamentally similar to *Cornigella immotipedata* Kesling with the exception that the posterior lobe (L4 of Kesling) is represented by two discrete nodes. This further disruption of the lobation gives rise to the supposition that the dorsal (L2 and L3 of Kesling) and the two ventral nodes may be parts of two separate lobes.

Type material. Figured specimens GSC 109968, 109969.

Occurrence. Rare specimens from the Arkona Formation of GSC DD1.

Genus *Stictobollia* Kesling and Chilman, 1978

Type species. Stictobollia alethaae (Coley), 1954.

Stictobollia alethaae (Coley), 1954

Plate 2, figures 5-7

Dizygopleura alethaae Coley, 1954, p. 462; Pl. 53, fig. 6.
Stictobollia alethaae (Coley). Kesling and Chilman, 1978, p. 50; Pl. 81, figs. 67-86; Pl. 82, figs. 23-29; Pl. 83, figs. 44-46.

Remarks. This is the only species reported for the genus. The lobes are smooth and the sulci are coarsely pitted. It is approximately oval (except for the long, straight dorsum) and twice as long as high. If overlap is present it is L/R.

Type material. Hypotypes GSC 109970-109972.

Occurrence. Rare specimens from the Arkona and Widder formations in GSC DD1.

Genus *Ulrichia* Jones, 1890

Type species. Ulrichia conradi Jones, 1890.

Remarks. Distinction between *Ulrichia* Jones, 1890 and *Xystinotus* Kesling, 1953 is difficult to establish. As Kesling and Chilman (1978, p. 53) suggested, both *X. subnodatus* (Turner) and *X. wrightorum* Kesling strongly resemble *U. illinearis* Kesling, 1953. Because of uncertainty in generic and specific designation, specimens that Kesling and Chilman have identified as species of *Xystinotus* are herein tentatively considered as *Ulrichia*.

Ulrichia conradi Jones, 1890

Plate 2, figures 8-11

Ulrichia conradi Jones, 1890, p. 544; fig 2.
Ulrichia conradi Jones. Kesling and Chilman, 1978, p. 50, 51; Pl. 41, figs. 21-27.

Remarks. U. conradi Jones has the subequal, blunt and widely spaced dorsal nodes at or near the dorsal margin. The marginal ridge marks the free border of the valves. There are no marginal spinules and the domicilium bears reticulae of uniform size.

Type material. Hypotypes GSC 109973-109976.

Occurrence. Specimens of this species are not common but they range in occurrence throughout the Hamilton strata from the Bell to the Widder formations in GSC DD2. No specimens were recovered from GSC DD1.

Ulrichia fastidiosa Kesling and Chilman, 1978

Plate 2, figures 12, 13

Ulrichia fastidiosa Kesling and Chilman, 1978, p. 51; Pl. 41, figs. 7-20; Pl. 42, figs. 9-24; Pl. 106, figs. 20-23; Pl. 114, fig. 7.

Remarks. The most distinguishing feature of this ulrichiid species is the large size of the dorsal spines and the fact that the posterior spine is curved and inclined posteriorly. The marginal ridge is ornamented with fine to moderately sized reticulae.

Type material. Hypotypes GSC 109977, 109978.

Occurrence. Arkona Formation in GSC DD2.

Ulrichia fragilis Warthin, 1934

Plate 2, figures 14-21; Plate 3, figure 1

Ulrichia fragilis Warthin, 1934, p. 213, 214; Pl. 1, fig. 11.
Ulrichia fragilis Warthin. Kesling and Chilman, 1978, p. 53; Pl. 42, figs. 39-54; Pl. 43, figs. 23-30; Pl. 110, fig. 3; Pl. 114, fig. 6.

Remarks. The most remarkable features of this species are dorsal nodes that are closely appressed to the surface of the domicilium, the marked posterior swing of the valves, and the fact that the marginal ridge does not mark the free margin of the valve but is removed from the margin, especially anteriorly and posteriorly.

Type material. Hypotypes GSC 109979-109987.

Occurrence. Bell, Arkona and Widder formations in GSC DD1; Bell, Rockport Quarry, Arkona, Widder and Ipperwash formations in GSC DD2.

Ulrichia illinearis Kesling, 1953

Plate 3, figures 2-9

Ulrichia illinearis Kesling, 1953, p. 199, 200; Pl. I, figs. 28-32.
Ulrichia illinearis Kesling. Kesling and Chilman, 1978, p. 52; Pl. 43, figs. 31-36; Pl. 114, fig. 5.

Remarks. The dorsal nodes of this species are at different distances from the dorsum; the anterior node is commonly more ventral on the domicilium than the posterior node. Also, the marginal ridge is somewhat removed from the free margin especially anteriorly and posteriorly.

Type material. Hypotypes GSC 109988-109995.

Occurrence. Bell, Rockport Quarry and Arkona formations in GSC DD1, and Arkona, Hungry Hollow and Widder formations in GSC DD2.

Ulrichia spinifera Coryell and Malkin, 1936

Plate 3, figures 10-18

Ulrichia spinifera Coryell and Malkin, 1936, p. 1, 2, figs 1, 2.

Ulrichia spinifera Coryell and Malkin. Kesling and Chilman, 1978, p. 52; Pl. 41, figs. 1-6; Pl. 42, figs. 25-38; Pl. 43, figs. 1-22; Pl. 114, fig. 4; Pl. 115, fig. 3.

Remarks. The most obvious feature of this species is the presence of a row of prominent spines along the free margin. The dorsal spines (L2 and L3) are prominent, directed dorsally and commonly ornamented with minute reticulae. The domicilium is ornamented with coarse reticulae of random orientation.

Type material. Hypotypes GSC 109996-110004.

Occurrence. Bell, Rockport Quarry, Arkona and Widder formations in GSC DD1; Rockport Quarry, Arkona and Widder formations in GSC DD2.

Family KIRKBYELLIDAE Sohn, 1961

Genus *Kirkbyella* Coryell and Booth, 1933

Type species. Kirkbyella typa Coryell and Booth, 1933.

Subgenus *Kirkbyella* Coryell and Booth, 1933

Kirkbyella (*Kirkbyella*) *bellipuncta* (Van Pelt), 1933

Plate 3, figures 19-21; Plate 4, figures 1-4

Amphissites bellipunctus Van Pelt, 1933, p. 332; Pl. 39, figs. 37-40.

Kirkbyella (*Kirkbyella*) *bellipuncta* (Van Pelt). Kesling and Chilman, 1978, p. 53, 54; Pl. 39, figs. 23-36; Pl. 40, figs. 1-12; Pl. 112, fig. 1.

Remarks. The large, characteristic pits and the ventral ridge of this species distinguishes it from other kirkbyellids. The ridge is distinctly set off from the rest of the domicilium except anteriorly. S2 is usually broad and deep, extending from the dorsum to the dorsal edge of the ventral ridge. In some specimens, however, it may be effaced either by infilling sediment or encroachment of the domicilial pits, making the lateral margins of S2 difficult to determine.

Type material. Hypotypes GSC 110005-110011.

Occurrence. Arkona and Widder formations in GSC DD1 and Arkona, Widder and Ipperwash formations in GSC DD2.

Kirkbyella (*Kirkbyella*) sp.

Plate 4, figures 5, 6

Remarks. This species bears the coarse punctae and relatively pronounced ventral ridge of *K.* (*K.*) *bellipuncta* (Van Pelt) but is 2.1 to 2.5x longer than high. S2 appears to have dorsal and ventral areas of greater depth. Also, the dorsal margin of the ventral ridge is not as distinctly set off from the domicilium as that of *K.* (*K.*) *bellipuncta*. It occurs only rarely in GSC DD1.

Type material. Figured specimens GSC 110012, 110013.

Occurrence. Bell and basal Rockport Quarry formations in GSC DD1.

Subgenus *Berdanella* Sohn, 1961

Kirkbyella (*Berdanella*) *unicornis* Coryell and Malkin, 1936

Plate 4, figure 7

Kirkbyella unicornis Coryell and Malkin, 1936, p. 5; Pl. 1, fig. 13.

Kirkbyella (*Berdanella*) *unicornis* Coryell and Malkin. Kesling and Chilman, 1978, p. 55; Pl. 39, figs. 43-56; Pl. 40, figs. 13-25; Pl. 112, fig. 3.

Remarks. As stated by Kesling and Chilman (1978, p. 55), this species is larger and longer than *K.* (*K.*) *bellipuncta* (Van Pelt) and has a much less distinct ventral ridge. S2 is apparently less distinct and the surface reticulation is somewhat finer than *K.* (*K.*) *bellipuncta*.

Type material. Hypotype GSC 110014.

Occurrence. Bell, Arkona, Hungry Hollow and Ipperwash formations in GSC DD2.

Family RICHINIDAE Scott 1961

Genus *Richina* Coryell and Malkin, 1936

Type species. Richina truncata Coryell and Malkin, 1936.

Richina subcircularis Coryell and Malkin, 1936

Plate 4, figures 8-10

Richina subcircularis Coryell and Malkin, 1936, p. 4, fig. 7.
Richina subcircularis Coryell and Malkin. Kesling and Chilman, 1978, p. 55; Pl. 46, figs. 1-4; Pl. 107, figs. 1-4.

Remarks. This species has a distinctly subcircular outline. It is possible that L1 may be expressed as a long, near marginal ridge extending from the anterodorsal corner of the valve and merging with the domicilium ventral of L2. L2 is a large, rounded lobe beneath the hingeline, L3 is a smaller lobe that may be circular or slightly pointed. The surface of the domicilium is finely punctate; the lobes are variably punctate or smooth.

Type material. Hypotypes GSC 110015-110017.

Occurrence. Arkona, Widder and Ipperwash formations in GSC DD2.

Richina trinodosa Kesling and Chilman, 1978

Plate 4, figure 11

Richina trinodosa Kesling and Chilman, 1978, p. 55, 56; Pl. 46, figs. 5-19.

Remarks. One poorly preserved specimen bearing three nodes in a similar position to those of *R. trinodosa* was recovered from the Arkona Formation of GSC DD2. The anterodorsal node is large and rounded; the posterior dorsal node is small and pointed; and the most ventral node, intermediate and below the other nodes, is blunt and indistinct.

Type material. Hypotype GSC 110018.

Occurrence. Arkona Formation in GSC DD2.

Richina? sp.

Plate 4, figure 12

Remarks. Specimens are more preplete than other species reported from the Hamilton Group. L2 is much reduced, L3 is more pronounced and the hingeline is proportionately longer than that of *R. subcircularis* and *R. truncata*. Preservation is not as good as other specimens of the genus, consequently the generic designation is in question.

Type material. Figured specimen GSC 110019.

Occurrence. Arkona and Ipperwash formations in GSC DD2.

Superfamily HOLLINACEA Swartz, 1936

Family CTENOLOCULINIDAE Jaanusson and Martinsson, 1956

Subfamily CTENOLOCULININAE Jaanusson and Martinson, 1956

Genus *Ctenoloculina* Bassler, 1941

Type species. Tetradella cicatricosa Warthin, 1934.

Ctenoloculina cicatricosa (Warthin) 1934

Plate 4, figures 13-23; Plate 5, figures 1-4

Tetradella cicatricosa Warthin, 1934, p. 209; Pl. 1, figs. 4-6.
Ctenoloculina cicatricosa (Warthin). Kesling and Chilman, 1978, p. 58; Pl. 5, figs. 1-22; Pl. 6, figs. 10-19; Pl. 16, figs. 3-6; Pl. 17, figs. 7-9; Pl. 18, figs. 1-20; Pl. 19, figs. 1-18; Pl. 20, figs. 1-18; Pl. 21, figs. 1-18; Pl. 21, figs. 11-13; Pl. 109, figs. 6, 7; Pl. 110, fig. 5; Pl. 118, figs. 5, 8; Pl. 119, figs. 1-4; Pl. 120, fig. 3; Pl. 121, fig. 1; Pl. 122, fig. 3.
Ctenoloculina cicatricosa (Warthin). Kesling and Chilman, 1987, p. 34; Pl. 1, figs. 6-15; Pl. 5, figs. 12, 13.

Remarks. This species is widespread throughout the Hamilton Group in both GSC cores. The relatively large size of adults in comparison with other species of the genus is one element in distinguishing between *C. cicatricosa* and twelve other species of the genus recognized by Kesling and Chilman (1987). The tecnomorph is marked by 6 round loculi on each valve, each with prominent rims set off from the domicilium by a continuous velar ridge. The ornamentation of the lobate areas extends to and onto the velar ridge. The tecnomorph has a prominent ventral projection on L2 and sometimes L3. Both dimorphs have highly ornamented lobes bordered by ridges.

Type material. Hypotypes GSC 110020-110034.

Occurrence. Throughout the Hamilton Group in both GSC DD1 and GSC DD2.

Ctenoloculina acanthina Kesling, 1953

Plate 5, figures 5-13

Ctenoloculina acanthina Kesling, 1953, p. 206, 207; Pl. II, figs. 1-13.
Ctenoloculina acanthina Kesling. Kesling and Chilman, 1978, p. 58, 59; Pl. 16, figs. 1, 2; Pl. 17, figs. 10-20; Pl. 21, figs. 1-10; Pl. 111, figs. 3, 4.
Ctenoloculina acanthina Kesling. Kesling and Chilman, 1987, p. 29, 32; Pl. 1, figs. 1-5; Pl. 2, figs. 1-9.

Remarks. This species is best distinguished by the conspicuous spinelets or papillae that are scattered randomly along the rims of the lobate areas of both dimorphs. Some papillae also occur on the surface of the lobate areas and a more prominent spine-like projection may be present at the dorsal extremities of the lobate areas. Kesling and Chilman (1987, p. 32) pointed out the similarity of this species to *C. widderensis, C. acrolobata* and *C. didyma,* all of which bear papillae on the lobate areas (especially on L4). Distinguishing between these species is difficult if not impossible, consequently specimens of some or all of those species may be included herein.

Type material. Hypotypes GSC 110035-110043.

Occurrence. Arkona and Widder formations in GSC DD1 and Arkona Formation in GSC DD2.

Ctenoloculina n. sp.?

Plate 5, figures 14-17

Remarks. This, possibly new, species is distinguished by being more elongate than other ctenoloculinids, being twice or more as long as high. Tecnomorphs have the spurs of L2 and L3 extending posteroventrally. Heteromorphs have the velar flange touching the ventral margins of L2 and L3 but these lobes do not extend onto the flange. Both dimorphs bear minute spines on L4. The lobes appear to bear indistinct marginal rims but these may have been abraided during transportation.

Type material. Figured specimens GSC 110044-110047.

Occurrence. Rockport Quarry and Arkona formations in GSC DD1; Rockport Quarry, Arkona and Ipperwash formations in GSC DD2.

Ctenoloculina sp.

Plate 5, figure 18

Remarks. These poorly preserved specimens have the lobation semi-effaced. The velar frill is smooth and complete from the anterodorsal corner to the posteroventral part of the valve, where it terminates abruptly. The surface of the valves is papillose, similar to that of *C. acanthina*, but there does not appear to be an anterodorsal spine on L1.

Type material. Figured specimen GSC 110048.

Occurrence. Rockport Quarry, Arkona and Ipperwash formations in GSC DD2.

Subfamily PARABOLBININAE Bless and Jordan, 1971

Genus *Subligaculum* Kesling and McMillan, 1951

Type species. Subligaculum scrobiculatum Kesling and McMillan, 1951.

Subligaculum calcaratum Kesling, 1953

Plate 5, figures 19-23

Subligaculum calcaratum Kesling, 1953, p. 209, 210; Pl. I, figs. 14-20; Pl. IV, figs. 30, 31, 34, 35.
Subligaculum calcaratum Kesling. Kesling and Chilman, 1987, p. 41; Pl. 55, figs. 15-28; Pl. 56, figs. 15-22; Pl. 69, figs. 17-25.

Remarks. This species has no posterocentral depression. The heteromorphs have a distinct spur posterior of the narrow velar frill and the surface of both dimorphs bears numerous papillae superimposed on a faint reticulation. Both dimorphs have a short, indistinct S2 terminating above or at the mid-height of the valves. Tecnomorphs have anterior and posterior ventral spurs.

Type material. Hypotypes GSC 110049-110053.

Occurrence. Arkona Formation of GSC DD1 and GSC DD2.

Genus *Tetrasacculus* Stewart, 1936

Type species. Tetrasacculus bilobus Stewart, 1936.

Tetrasacculus bilobus Stewart, 1936

Plate 6, figures 1-13

Tetrasacculus bilobus Stewart, 1936, p. 744, 745; Pl. 100, figs. 8-11.
Tetrasacculus bilobus Stewart. Kesling and Chilman, 1978, p. 60; Pl. 30, figs. 1-53; Pl. 31, figs. 1-10; Pl. 110, figs. 1, 2.
Tetrasacculus bilobus Stewart. Kesling and Chilman, 1987, p. 45; Pl. 48, figs. 5-17; Pl. 52, figs. 14-17.

Remarks. S2 in both dimorphs is a shallow to relatively deep groove obliquely crossing the valve from near mid-dorsum to near the anteroventral margin; it interrupts the velar ridge and, in the case of tecnomorphs, the posterior corner of the anterior part of the ridge may occur as a spur. There is a low to conspicuous ventral lobe posterior of S2. The heteromorphs bear 4 large loculi with pronounced marginal rims, the posterior loculus is elongated and lacks a posterior rim. The surface is coarsely reticulate in most specimens.

Type material. Hypotypes GSC 110054-110066.

Occurrence. Arkona, Hungry Hollow and Widder formations in GSC DD1; Bell, Rockport Quarry, Arkona, Hungry Hollow and Widder formations in GSC DD2.

Family HOLLINIDAE Swartz, 1936

Subfamily FALSIPOLLICINAE Bless and Jordan, 1971

Genus *Falsipollex* Kesling and McMillan, 1951

Type species. Falsipollex altituberculatus Kesling and McMillan, 1951.

Falsipollex lativelatus (Kesling and McMillan), 1951

Plate 6, figures 14-25

Hollinella lativelata Kesling and McMillan, 1951, p. 58-60; Pl. V, figs. 1-5.

Falsipollex lativelatus (Kesling and McMillan). Kesling and Chilman, 1978, p. 60, 61; Pl. 21, figs. 14-22; Pl. 22, figs. 8-19; Pl. 23, figs. 1-10; Pl. 25, figs. 10-16; Pl. 28, figs. 11, 12; Pl. 32, figs. 1-9; Pl. 38, figs. 5-7; Pl. 104, figs. 1-6; Pl. 110, fig. 4; Pl. 117, figs. 4, 5; Pl. 121, figs. 2, 3; Pl. 123, fig. 2.

Falsipollex lativelatus (Kesling and McMillan). Kesling and Chilman, 1987, p. 51, 52; Pl. 58, figs. 3-16; Pl. 70, figs. 8-16.

Remarks. Specimens of this species are relatively large and approximately twice as long as they are high. L3 is a prominent bulbous lobe, whereas L2 is a low node well removed from the dorsum. L1 may or may not be present. The heteromorphic velar frill, as shown by Kesling and Chilman (1978, Pl. 23, fig. 12), is broad and extends from the anterodorsal corner of the valve to the posterior margin. None of the specimens from the present collections displays this feature in detail because all of the hetermorphic vela are abraided. Tecnomorphs have anterior and posterior ventral spurs, the anterior spur tending to be flange like and flattened laterally. Surface of the valve is evenly papillose.

Type material. Hypotypes GSC 110067-110078.

Occurrence. Bell and Arkona formations in GSC DD1; Bell, Arkona, Hungry Hollow, Widder and Ipperwash formations in GSC DD2.

Falsipollex valgus Kesling, 1952

Plate 7, figures 1-5

Falsipollex valgus Kesling, 1952, p. 52; Pl. II, figs. 19-26.

Falsipollex valgus Kesling. Kesling and Chilman, 1987, p. 53; Pl. 47, figs. 20-32; Pl. 53, figs. 11-19; Pl. 54, figs. 1-5; Pl. 70, figs. 17, 18.

Remarks. This species is marked by a large, round L3 extending to or above the dorsum, an inverted "T"-shaped S2 that extends from the mid-dorsum anterior of L3 and branching near mid-valve to extend posteriorly beneath L3 and anteriorly beneath L2 to the ventral frill. Heteromorphs have a broad, prominent incurved frill that extends from the anterodorsal corner of the valve to beneath L2 and a posteroventral spur well removed from the anterior frill. Tecnomorphs have anterior and posterior ventral spurs. The domicilium and velar frill are ornamented with minute papillae and the free margin border is denticulate.

Type material. Hypotypes GSC 110079-110083.

Occurrence. Bell, Arkona and Widder formations in GSC DD1; Arkona, Hungry Hollow and Widder formations in GSC DD2.

Falsipollex? sp.

Plate 7, figure 6

Remarks. Rare specimens, apparently of a species of *Falsipollex*, occur in the Hungry Hollow Formation of GSC DD2. Only immature tecnomorphs are found so this indentification may well be in doubt. S2 is short and indistinct; the anterior spur is relatively minute and the posterior spur does not appear to be present. The domicilium is pustulose.

Type material. Figured specimen GSC 110084.

Occurrence. Hungry Hollow Formation in GSC DD2.

Family HOLLINELLIDAE Bless and Jordan, 1971

Genus *Hollinella* Coryell, 1928

Subgenus *Keslingella* Bless and Jordan, 1970

Type species. Hollinella pumila Kesling, 1952.

Hollinella (*Keslingella*) *pumila* Kesling, 1952

Plate 7, figures 7-11

Hollinella pumila Kesling, 1952, p. 48, 49; Pl. I, figs. 16-23.
Hollinella (*Keslingella*) *pumila* Kesling. Kesling and Chilman, 1978, p. 64; Pl. 13, figs. 11-24; Pl. 14, figs. 1-3; Pl. 15, figs. 1-7; Pl. 16, figs. 7-19; Pl. 109, figs. 1, 2.
Hollinella (*Keslingella*) *pumila* Kesling. Kesling and Chilman, 1987, p. 69, 70; Pl. 27, figs. 19-23; Pl. 28, figs. 13-23.

Remarks. This species is preplete, with a pointed posterior dorsal cardinal angle. L3 is relatively large, low and bulbous, and L2 is indistinct, particularly anteriorly. Juveniles have anterior and posterior ventral spurs; adults have a continuous, narrow velar flange, which is more pronounced in heteromorphs, and forms the outer margin of the antrum. The surface is papillose.

Type material. Hypotypes GSC 110085-110089.

Occurrence. Bell, Arkona and Widder formations in GSC DD1; throughout the Hamilton Group in GSC DD2.

Genus *Labrosavelum* Kesling and Chilman, 1987

Type species. Hollinella labrosa Kesling and Weiss, 1953.

Labrosavelum sphaericum Kesling and Chilman, 1987

Plate 7, figures 12-15

Hollinella labrosa Kesling and Weiss, 1953, p. 35, 38; Pl. II, figs. 1-4.
Hollinella labrosa Kesling and Weiss. Kesling and Chilman, 1978, p. 65; Pl. 10, figs. 18, 19; Pl. 14, figs. 10-13.
Labrosavelum sphaericum Kesling and Chilman, 1987, p. 71; Pl. 38, figs. 6-11.

Remarks. Valves preplete; heteromorphs have a broad frill extending from anterodorsal corner and ending abruptly posteroventrally. The entire surface is papillose. Quadrilobate, with L3 very large, spherical, extending to and slightly above the dorsum.

Type material. Hypotypes GSC 110090-110093.

Occurrence. Widder and Ipperwash formations in GSC DD2.

Superfamily KIRKBYACEA Ulrich and Bassler, 1906

Family AMPHISSELLIDAE Kesling and Chilman, 1978

Genus *Doraclatum* Stover, 1956

Type species. Amphissites conatus Coryell and Malkin, 1936.

Doraclatum conatum (Coryell and Malkin), 1936

Plate 7, figures 16, 17

Amphissites conatus Coryell and Malkin, 1936, p. 5, figs. 12, 12a.
Doraclatum conatum (Coryell and Malkin). Kesling and Chilman, 1978, p. 68; Pl. 82, figs. 1-19; Pl. 90, figs. 24, 25; Pl. 93, figs. 11-18; Pl. 120, fig. 2.

Remarks. Specimens are ovate in lateral view with a faint marginal structure. L2 is a conate lobe at mid-length of the valve, slightly ventral of dorsum. Surface of valves coarsely reticulate with few scattered papillae.

Type material. Hypotypes GSC 110094, 110095.

Occurrence. Bell and Arkona formations in GSC DD1; Arkona Formation in GSC DD2.

Genus *Dirhabdus* Kesling and Chilman, 1978

Type species. Primitiella multicostata Pauken, 1966.

Dirhabdus multicostatus (Pauken) 1966

Plate 7, figures 18-23

Primitiella multicostata Pauken, 1966, p. 544; Pl. 2, figs. 11, 14-16.
Dirhabdus multicostatus (Pauken). Kesling and Chilman, 1978, p. 68; Pl. 98, figs. 21-41; Pl. 99, figs. 1-10; Pl. 103, figs. 10-17; Pl. 106, figs. 18, 19; Pl. 108, fig. 4.

Remarks. The valves are ovate, marked by numerous vertical ridges, the largest of which are located in the anterior and posterior quarters. The ridges are joined by horizontal elements, giving the entire valve a reticulate appearance. The

muscle scar is expressed as a flat, circular spot slightly anterior of the mid-length of the valve.

Type material. Hypotypes GSC 110096-110101.

Occurrence. Bell Formation in GSC DD1.

Family ARCYZONIDAE Kesling, 1961

Genus *Arcyzona* Kesling, 1952

Type species. Amphissites diademata Van Pelt, 1933.

Arcyzona homalosagenota Kesling, 1952

Plate 7, figure 24; Plate 8, figures 1-8

Arcyzona homalosagenota Kesling, 1952, p. 34; Pl. V, figs. 17, 18.
Arcyzona homalosagenota Kesling. Kesling and Chilman, 1978, p. 71; Pl. 8, figs. 9-16; Pl. 41, figs. 28-34.

Remarks. This species is marked by the lack of a defined carina or carinal ridge, the even distribution of reticulae and the very low velar ridge. The central pit is usually distinct but may be hidden by the reticulation.

Type material. Hypotypes GSC 110102-110110.

Occurrence. Bell, Arkona and Widder formations in GSC DD1; Rockport Quarry, Arkona, Hungry Hollow, Widder and Ipperwash formations in GSC DD2.

Arcyzona sp.

Plate 8, figures 9-12

Remarks. Specimens included here have some of the reticulae effaced but there is definite indication of a carina and there appears to be a lineation of the reticulae unlike the even reticulation of *A. homalosagenota*. This latter feature is typical of several species from the Silica Formation reported by Kesling and Chilman (1978). Possibly more than one species is included herein as *Arcyzona* sp., but no definite attribution is possible.

Type material. Figured specimens GSC 110111-110114.

Occurrence. Bell, Arkona and Widder formations in GSC DD1; Arkona and Widder formations in GSC DD2.

Family SCROBICULIDAE Posner, 1951

Genus *Scrobicula* Posner, 1951

Type species. Cytherella? *scrobiculata* Jones, Kirkby and Brady, 1884.

Scrobicula concentrica (Stover) 1956

Plate 8, figures 13, 14

Roundyella? *concentrica* Stover, 1956.

Remarks. This species lacks a marginal ridge, S2 is a smooth central spot and there is an even reticulation over the entire valve.

Type material. Hypotypes GSC 110115, 110116.

Occurrence. Hungry Hollow and Widder formations in GSC DD2.

Superfamily APARCHITACEA Swartz, 1945

Family APARCHITIDAE Jones, 1901

Genus *Ehlersia* Kesling, Crafts, Darby, Shuback and Smith, 1952

Type species. Macronotella hypercala Kesling and Kilgore, 1952.

Ehlersida hypercala (Kesling and Kilgore), 1952

Plate 8, figure 15

Macronotella hypercala Kesling and Kilgore, 1952; Pl. I, figs. 25-36.
Ehlersia hypercala (Kesling and Kilgore). Kesling and Chilman, 1978, p. 73; Pl. 40, figs. 26-29; Pl. 105, figs. 24-29.

Remarks. This is a rare species in the present collections. The carapace is slightly preplete and almost subelliptical. There is no lobation or sulcation, and the entire valve is covered with coarse pits except for the central muscle spot and the marginal area, which are smooth. There is a narrow marginal ridge sloping down to the free margin.

Type material. Hypotype GSC 110117.

Occurrence. Widder Formation in GSC DD2.

Family COELONELLIDAE Sohn, 1971

Genus *Coelonella* Stewart, 1936

Type species. Isochilina? *scapha* Stewart, 1936.

Coelonella scapha (Stewart), 1936

Plate 8, figures 16, 17

Isochilina? *scapha* Stewart, 1930, p. 57; Pl. 1, figs. 11, 12.
Coelonella scapha (Stewart). Kesling and Chilman, 1978, p. 76; Pl. 102, figs. 26-38; Pl. 103, figs. 18-20; Pl. 107, fig. 30.

Remarks. This species is distinguished from *C. Plana* Stewart by having an incised hingeline, a greater posterior height and by being more robust. As Sohn (1971, p. A19) and Kesling and Chilman (1987, p. 76) have suggested, there may be dimorphism between *C. scapha* and *C. plana* with *C. scapha* as the heteromorph. Chilman and Kesling (1987), however, did not include either of these species in their discussion of dimorphic species of the Great Lakes region.

Type material. Hypotypes GSC 110118, 110119.

Occurrence. Widder Formation in GSC DD2.

Suborder KLOEDENELLOCOPINA Scott, 1961

Superfamily KLOEDENELLACEA Ulrich and Bassler, 1908

Family KLOEDENELLIDAE Ulrich and Bassler, 1908

Subfamily DIZYGOPLEURINAE Egerov, 1950

Genus *Dizygopleura* Ulrich and Bassler, 1923

Type species. Dizygopleura swartzi Ulrich and Bassler, 1923.

Dizygopleura euglyphea Warthin, 1934

Plate 8, figures 18-20

Dizygopleura euglyphea Warthin, 1934, p. 210, 211; Pl. 1, fig. 7.
Dizygopleura euglyphea Warthin. Kesling and Chilman, 1978, p. 77; Pl. 44, figs. 17-28; Pl. 45, figs. 1-4; Pl. 47, figs. 40-42.

Remarks. This is a large dizygopleurid showing the typical sinuous lobation and a moderately large, triangular stragulum. The posterodorsal corner of the valve is extended rather than rounded, the sulci tend to be straight, not geniculate, and dimorphism is expressed by the heteromorphic expansion of L4 and the posterior concavity of L4 in tecnomorphs, making that lobe more prominent.

Type material. Hypotypes GSC 110120-110122.

Occurrence. Rockport Quarry and Arkona formations in GSC DD2.

Dizygopleura trisinuata Van Pelt, 1933

Plate 8, figures 21-23; Plate 9, figures 1-6

Dizygopleura trisinuata Van Pelt, 1933, p. 328; Pl. 39, figs. 61, 62.
Dizygopleura trisinuata Van Pelt. Kesling and Chilman, 1978, p. 77, 79; Pl. 44, figs. 13-16; Pl. 45, figs. 5-24; Pl. 47, figs. 43-54; Pl. 103, figs. 25-28.

Remarks. This dizygopleurid species is large with a rounded rather then attenuated posterodorsal corner and a longer rather than wide, triangular stragulum. The sulci are geniculate or curved ventrally, S1 extending posteriorly, S2 slightly anteriorly and S3 anteriorly. Dimorphism, as in *D. euglyphea*, is expressed by the tumid posterior lobe (L4) of heteromorphs and the ridged L4 of tecnomorphs running parallel with the posterior margin.

Type material. Hypotype GSC 110123-110131.

Occurrence. Bell, Rockport Quarry, Arkona and Hungry Hollow formations in both GSC DD1 and GSC DD2.

Genus *Poloniella* Gürich, 1896

Type species. Poloniella devonica Gürich, 1896.

Remarks. This genus is distinguished from *Dizygopleura* by the connection of S1 and S3 ventral of S2 and the presence of a free marginal ridge connecting L1 and L4. Also, the stragulum tends to be triangular rather than elongate.

Poloniella cingulata Warthin, 1934

Plate 9, figures 7-15

Poloniella cingulata Warthin, 1934, p. 212; Pl. I, fig. 9.

Poloniella cingulata Warthin. Kesling and Chilman, 1978, p. 79; Pl. 61, figs. 1-16; Pl. 62, figs. 1-21; Pl. 63, figs. 27-34.

Remarks. Individuals of this species tend to be large, long and preplete. L1 is isolated at the anterior margin of the valve, joined ventrally by a ridge with L4. S1 curves ventrally to join S3 ventral of L2 and L3. S2 is a deep sulcus, slightly geniculate, separating L2 and L3 dorsally but not ventrally. The dorsal margin is marked by an incised hinge with a triangular stragulum.

Type material. Hypotypes GSC 110132-110140.

Occurrence. Bell, Rockport Quarry and Arkona formations in GSC DD1; uppermost Rockport Quarry, Arkona, Hungry Hollow and Ipperwash formations in GSC DD2.

Poloniella sp.?

Plate 9, figures 16-19

Remarks. This species is small and preplete, with an incised hingeline and a prominent, triangular stragulum. L1 is isolated from the rest of the lobation by a prominent S1 that curves posteriorly ventral of L2 and L3. L2 is narrow, club-shaped dorsally, and joined ventrally to the prominent L3. L4 of heteromorphs broad, inflated, extending to the posterior margin; that of tecnomorphs ridge-like, posteriorly concave.

The small size of specimens of this species may indicate that it comprises only immature individuals of *P. cingulata*, but because presumed heteromorphic specimens have been found, this may be questioned.

Type material. Figured specimens GSC 110141-110144.

Occurrence. Uppermost bed of the Rockport Quarry Formation and throughout the Arkona Formation of GSC DD2.

Subfamily KLOEDENELLINAE Egorov, 1950

Genus *Eukloedenella* Ulrich and Bassler, 1923

Type species. Eukloedenella umbilicata Ulrich and Bassler, 1923.

Eukloedenella doverensis Turner, 1939

Plate 9, figures 20-23; Plate 10, figures 1-3

Eukloedenella doverensis Turner, 1939, p. 20; Pl. 1, figs. 5-8.
Eukloedenella doverensis Turner. Kesling and Chilman, 1978, p. 79; Pl. 82, figs. 42-53; Pl. 83, figs. 1-20; Pl. 88, figs. 1-8.

Remarks. This large ostracode is commonly found in great numbers throughout the Hamilton Group. It is characterized by a short, narrow dorsal sulcus that extends from the dorsum a small distance toward mid-valve. The posterior dorsal corner of the valve is somewhat elevated whereas the anterior margin slopes from the anterodorsal corner of the valve to produce a somewhat narrowly rounded anterior margin. Kesling and Chilman (1978, p. 79) remarked on the dimorphism exhibited by this species – the heteromorphs possess typical kloedenellid posterior tumidity. This is difficult to ascertain on most of the larger (presumably adult) specimens because the amount of tumidity is minimal.

Type material. Hypotypes GSC 110145-110151.

Occurrence. Rockport Quarry and Arkona formations in GSC DD1; Bell, Rockport Quarry, Arkona, Hungry Hollow and Ipperwash formations in GSC DD2.

Genus *Punctoprimitia* Stewart and Hendrix, 1945

Type species. Haploprimitia simplex Stewart, 1936.

Punctoprimitia simplex (Stewart) 1936

Plate 10, figures 4-9

Haploprimitia simplex Stewart, 1936, p. 743; Pl. 100, fig. 5.
Punctoprimitia simplex (Stewart). Kesling and Chilman, 1978, p. 80; Pl. 46, figs. 20-39; Pl. 48, figs. 1-12.

Remarks. Species of this genus are robust, bear a prominent, short, slightly posteriorly directed S2 and posteriorly have a planar flange from which the main part of the domicilium rises abruptly. Specimens of *P. simplex* (Stewart) have a smooth to only slightly punctate domicilium.

Type material. Hypotypes GSC 110152-110157.

Occurrence. Throughout the Hamilton Group strata in both GSC DD1 and GSC DD2.

Punctoprimitia punctata (Turner) 1939

Plate 10, figures 9-15

Haploprimitia punctata Turner, 1939, p. 10; Pl. 1, fig. 1.

Punctoprimitia simplex (Stewart). Kesling and Chilman, 1978, p. 80.

Remarks. Kesling and Chilman (1978) placed this species in synonymy with *P. simplex* (Stewart) probably because of the similarity in shape between the two species. They may not have considered the presence of large punctae on *P. punctata* (Turner) as a specific characteristic. During the present study the variation in size of punctae is considered of sufficient taxonomic importance to warrant the identification of two taxa.

Type material. Hypotypes GSC 110158-110163.

Occurrence. Widder Formation in GSC DD1; Widder and Ipperwash formations in GSC DD2.

Family GEISINIDAE Sohn, 1961

Genus *Hypotetragona* Morey, 1935

Type species. Hypotetragona impolita Morey, 1935.

Hypotetragona fractodorsalis Kesling and Chilman, 1978

Plate 10, figure 16

Hypotetragona fractodorsalis Kesling and Chilman, 1978, p. 82; Pl. 59, figs. 9-12, 25-46; Pl. 108, fig. 3.

Remarks. Kesling and Chilman (1978, p. 82) considered that the size, deep, pit-like sulcus (S2), chain-like reticulation and tumid posteroventral domicilium of heteromorphic valves distinguished this species from *H. aequitalis* Peterson and *H. harrietensis* (Coryell and Malkin) which also occur in Hamilton and equivalent strata in the Michigan Basin. Few specimens were recovered from the cores examined here, none of which were apparently crushed as reported by Kesling and Chilman (1978, p. 82). The presence of a relatively conspicuous L2 on the present specimens has not been recorded previously.

Type material. Hypotype 110164.

Occurrence. Arkona Formation in GSC DD1.

Hypotetragona harrietensis (Coryell and Malkin), 1936

Plate 10, figures 17-21

Janetina harrietensis Coryell and Malkin, 1936, p. 19, fig. 34.

Hypotetragona harrietensis (Coryell and Malkin). Kesling and Chilman, 1978, p. 83; Pl. 59, figs. 13-19; Pl. 60, figs. 1-9; Pl. 108, fig. 2.

Remarks. This is a large, hypotetragonid species characterized by concentric ridges predominantly concentrated around the margins of the valves, decreasing in elevation as they merge toward the medial (S2) sulcus of the valve. There is no apparent reticulation such as that exhibited by *H. fractodorsalis*.

Type material. Hypotypes GSC 110165-110169.

Occurrence. Bell and Arkona formations in both GSC DD1 and GSC DD2.

Order ERIDOSTRACA Adamczak, 1961

Family ERIDOCONCHIDAE Henningsmoen, 1953

Genus *Cryptophyllus* Levinson, 1951

Type species. Eridoconcha oboloides Ulrich and Bassler, 1923.

Cryptophyllus arsinius Stover, 1956

Plate 10, figures 22-26

Cryptophyllus arsinius Stover, 1956, p. 1139; Pl. 119, figs. 37-40.
Cryptophyllus arsinius Stover. Kesling and Chilman, 1978, p. 83; Pl. 101, figs. 9-17; Pl. 102, figs. 1-8; Pl. 103, figs. 23, 24; Pl. 120, fig. 4.

Remarks. As stated by Kesling and Chilman (1978, p. 83), "The concentric lamellae vary from 9 to 12". None of the present specimens appear to have more than 9 lamellae but these features are difficult to determine in the umbonal area. Unlike *C. minusculus*? and *C.* sp., *C. arsinius* is spatulate in lateral view and the umbo is central to near-central in position. This is the largest cryptophyllid in the collections.

Type material. Hypotypes GSC 110170-110174.

Occurrence. Bell and Rockport Quarry formations in GSC DD2.

Crypotophyllus minusculus? Kesling and Chilman, 1978

Plate 10, figure 27

Cryptophyllus minusculus Kesling and Chilman, 1978, p. 83, 84; Pl. 100, figs. 39-54; Pl. 102, figs. 9-12; Pl. 104, figs. 9-16; Pl. 105, figs. 10-18; Pl. 109, fig. 3.

Remarks. It is questionable whether this is *C. minusculus*. The umbo is off-centre and directed somewhat anteriorly, with an anterior bulge that may have been the spine of that species. Like *C. minusculus* there are fewer lamellae than *C. arsinius.*

Type material. Hypotype GSC 110175.

Occurrence. Bell Formation in GSC DD2.

Cryptophyllus sp.

Plate 11, figures 1, 2

Remarks. This cryptophyllid is ovate, and the lateral borders are equally rounded, making distinction between right and left valves difficult. The umbo is low, broad and central. Lamellae appear to vary in number from 3 to 6.

Type material. Figured specimens GSC 110176, 110177.

Occurrence. Bell Formation in GSC DD2.

Order PODOCOPIDA Sars, 1866

Suborder PODOCOPINA Sars, 1866

Family BAIRDIIDAE Sars, 1887

Genus *Rectobairdia* Sohn, 1960

Type species. Bairdia depressa Geis, 1932 (non Kafka, 1885).

Rectobairdia emaciata (Kesling and Kilgore) 1952

Plate 11, figure 3

Bairdia emaciata Kesling and Kilgore, 1952, p. 13; Pl. IV, figs. 4-8.

Rectobairdia emaciata (Kesling and Kilgore). Kesling and Chilman, 1978, p. 84, 85; Pl. 7, figs. 14-17; Pl. 78, figs. 8-11; Pl. 106, figs. 24-27; Pl. 107, figs. 31-34.

Remarks. Only abraded and crushed carapaces of this bairdioid-shaped species were found in the present collections. The dorsum is high and convex, the anterior and posterior borders are extended, the anterior border curving dorsally and the posterior border extending posteriorly without a curve. The surface is smooth.

Type material. Hypotype GSC 110178.

Occurrence. Widder Formation in GSC DD2.

Genus *Acratia* Delo, 1930

Type species. Acratia typica Delo, 1930.

Acratia simplex Kesling and Chilman, 1978

Plate 11, figure 4

Acratia simplex Kesling and Chilman, 1978, p. 85; Pl. 9, figs. 1-3; Pl. 10, figs. 3-5; Pl. 84, figs. 1-4; Pl. 104, figs. 25-34.

Remarks. Rare specimens of this species were found during the present study; all are crushed to some extent, possibly indicating that the shell was very thin. The shape is extended bairdioid, the dorsum and venter are evenly curved to the extended anterior and posterior extremities, giving the carapace a spindle shape.

Type material. Hypotype GSC 110179.

Occurrence. Arkona Formation in GSC DD1 and GSC DD2.

Family BEECHERELLIDAE Ulrich, 1894

Genus *Pronipantex* Kesling and Chilman, 1978

Type species. Pronipantex planus Kesling and Chilman, 1978.

Pronipantex planus Kesling and Chilman, 1978

Plate 11, figures 5, 6

Pronipantex planus Kesling and Chilman, 1978, p. 87; Pl. 75, figs. 1-18; Pl. 78, figs. 3-7.

Remarks. This species is semi-triangular in end view, the venter conspicuously flattened and the lateral surfaces slightly inflated. The anterior and posterior extremities are pointed, the posterior the more elongate. At the juncture of the lateral and ventral surfaces a sharp angulation is developed that may produce a ridge in beecherellid fashion. The surface is smooth. The genus is closely related to *Beecherella*, and the two genera may be synonymous.

Type material. Hypotypes GSC 110180, 110181.

Occurrence. Arkona and Widder formations in GSC DD2.

Genus *Wideneria* Kesling and Chilman, 1978

Type species. Wideneria lipsa Kesling and Chilman, 1978.

Wideneria lipsa Kesling and Chilman, 1978

Plate 11, figures 7-9

Wideneria lipsa Kesling and Chilman, 1978, p. 87, 88; Pl. 83, figs. 40-43; Pl. 84, figs. 24-45; Pl. 89, figs. 56-60.

Remarks. This species is essentially rectangular or trapezoidal in lateral view. The dorsum and venter are subparallel; the anterior and posterior extremities are rounded and flattened. The surface is smooth.

Type material. Hypotypes GSC 110182-110184.

Occurrence. Arkona Formation in GSC DD2.

Wideneria sp.?

Plate 11, figure 10

Remarks. Only one specimen of this species has been recovered. It is similar in most respects to *W. lipsa* but bears faint reticulae on the anterior half of the lateral surface.

Type material. Figured specimen GSC 110185.

Occurrence. Arkona Formation in GSC DD2.

Superfamily CYTHERACEA Baird, 1850

Family BYTHOCYTHERIDAE Roth, 1928

Genus *Monoceratina* Roth, 1928

Type species. Monoceratina ventrale Roth, 1928.

Monoceratina casei Warthin, 1934

Plate 11, figure 11

Monceratina casei Warthin, 1934, p. 207, 208; Pl. I, fig. 1.
Monoceratina casei Warthin. Kesling and Chilman, 1978, p. 88; Pl. 70, figs. 16-21; Pl. 71, figs. 9-30; Pl. 74, figs. 19-21.

Remarks. Hingeline long, relatively straight; anterior rounded into the curved venter, tapering posteroventrally to a pointed posterior dorsal extremity. Surface of valve granular with a pronounced ventral spinose projection at mid-length of valve.

Type material. Hypotype GSC 110186.

Occurrence. Rockport Quarry Formation in GSC DD2.

Suborder METACOPINA Sylvester-Bradley, 1961

Superfamily HEALDIACEA Harlton, 1933

Family HEALDIIDAE Harlton, 1933

Subfamily HEALDIOPSIDINAE Gründel, 1962

Genus *Ponderodictya* Coryell and Malkin, 1936

Type species. Cytherella? *bispinulatus* Stewart, 1927.

Ponderodictya punctulifera (Hall) 1860

Plate 11, figures 12-23

Leperditia punctulifera Hall, 1860, p. 92.
Ponderodictya punctulifera (Hall). Kesling and Chilman, 1978, p. 92; Pl. 52, figs. 1-4; Pl. 65, figs. 43, 44; Pl. 67, figs. 1-12; Pl. 68, figs. 13-17; Pl. 69, figs. 1-8; Pl. 70, figs. 1-10; Pl. 71, figs. 1-18; Pl. 114, figs. 2, 3; Pl. 117, fig. 3.

Remarks. This species has been described under a variety of generic and specific names (see Kesling and Chilman, 1978, p. 92). It is by far the largest ostracode in the Hamilton Group and in many collections is represented by the most numerous individuals. It is coarsely punctate, ovate in lateral view and has L/R overlap. There is considerable variation in ornamentation. The posterior quarter of the right valve is usually marked by two discrete spines but may have one spine or none; the anterior quarter of the right valve may bear a curved ridge parallel to the anterior margin, which may be reduced to a dorsal spinose projection. The left valve usually bears one posterior ventral spine and may or may not have an anterior structure. Kesling and Chilman (1978, p. 92) did not consider these variations in ornamentation to be important.

Type material. Hypotypes GSC 110187-110198.

Occurrence. Throughout the Hamilton Group in GSC DD1 and GSC DD2.

Ponderodictya ohioensis (Stewart), 1936

Plate 11, figures 24, 25

Hamiltonella ohioensis Stewart, 1936, p. 757, 758; Pl. 101, figs. 22, 23.
Ponderodictya ohioensis (Stewart). Kesling and Chilman, 1978, p. 92; Pl. 65, figs. 35-42; Pl. 66, figs. 1-12; Pl. 68, figs. 18-22.

Remarks. As Kesling and Chilman (1978, p. 92) have stated, "*Ponderodictya ohioensis* is smaller than *P. punctulifera* and appears to consistently lack the anterior ridges characteristic of that species." Specimens with these characteristics are found in the present collections but, with the range of variation seen in *P. punctulifera*, it may be questionable as to whether *P. ohioensis* should be considered a valid taxon.

Type material. Hypotypes GSC 110199, 110200.

Occurrence. Basal Arkona Formation in GSC DD1; Rockport Quarry, Arkona and Widder formations in GSC DD2.

Ponderodictya rhodesi Kesling and Chilman, 1978

Plate 11, figures 26, 27; Plate 12, figures 1-3

Ponderodictya rhodesi Kesling and Chilman, 1978, p. 92, 93; Pl. 51, figs. 5-8; Pl. 53, figs. 1-4; Pl. 72, figs 1-12; Pl. 73, figs. 1-12; Pl. 74, figs. 1-12; Pl. 114, fig. 1.

Remarks. The main criterion for identifying this species is the fact that, while specimens bear most of the characteristics of *P. punctulifera*, the valves are smooth, without reticulation, and ornamentation consists of three spines, two posterior and one anterior, in the position of the crescentic ridge usually present on *P. punctulifera*. During the present study a few smooth ponderodictyid specimens were observed that have the anterior spine elongated laterally into what could be interpreted as a linear structure but apparently not extensive enough to be considered a ridge.

Type material. Hypotypes GSC 110201-110205.

Occurrence. Rockport Quarry, Arkona and Widder formations in GSC DD2.

Ponderodictya sp.

Plate 12, figures 4, 5

Remarks. Some specimens with typical ponderodictyid lateral outline, L/R overlap and minor development of spines, bear a dimpled surface ornamentation that may be considered intermediate between *P. punctulifera, P. ohioensis* and *P. rhodesi*. With the degree of variation that exists within species of *Ponderodictya* it is difficult to consider this a discrete taxon.

Type material. Figured specimens GSC 110206, 110207.

Occurrence. Arkona and Widder formations in GSC DD1.

Family BAIRDIOCYPRIDIDAE Stover, 1961

Genus *Bairdiocypris* Kegel, 1932

Type species. Bythocypris (*Bairdiocypris*) *gerolsteinensis* Kegel, 1932.

Bairdiocypris transptyxis (Stover) 1956

Plate 12, figure 6

Bythocypris transptyxis Stover, 1956, p. 1120; Pl. 115, figs. 15, 16.
Bairdiocypris transptyxis (Stover). Kesling and Chilman, 1978, p. 94; Pl. 90, figs. 1-23; Pl. 91, figs. 1-12.

Remarks. Specimens of this species are large, with strong L/R overlap. The dorsum is highly arched with the anterior margin more narrowly rounded than the posterior margin.

Type material. Hypotype GSC 110208.

Occurrence. Arkona Formation in GSC DD1.

Bairdiocypris sp.

Remarks. Poorly preserved specimens of a bairdiocyprid species were recovered from basal beds of the Widder Formation in GSC DD2. None are figured here. In outline they are reminiscent of *B. gongylus* Kesling and Chilman, 1978, but none are well enough preserved to be identified with certainty.

Occurrence. Basal beds of the Widder Formation in GSC DD2.

Genus *Praepilatina* Polenova, 1970

Type species. Bairdiocypris praepilatus Polenova, 1960.

Praepilatina silicensis Kesling and Chilman, 1978

Plate 12, figures 7-10

Praepilatina silicensis Kesling and Chilman, 1978, p. 94, p. 95; Pl. 74, figs. 13-18; Pl. 75, figs. 19-26; Pl. 77, figs. 1-9; Pl. 78, figs. 1, 2; Pl. 116, figs. 5, 6.

Remarks. This highly arched species has conspicuous L/R overlap. The posteroventral corner is slightly attenuate; the anterior margin is more broadly curved. The surface is smooth.

Type material. Hypotypes GSC 110209-110212.

Occurrence. Arkona Formation in GSC DD1; Widder Formation in GSC DD2.

Genus *Cytherellina* Jones and Holl, 1869

Type species. Beyrichia siliqua Jones, 1885.

Cytherellina lucasensis (Stewart), 1936

Plate 12, figures 11-14

Bythocypris lucasensis Stewart, 1936, p. 755; Pl. 101, fig. 17.
Cytherellina lucasensis (Stewart). Kesling and Chilman, 1987, p. 96; Pl. 94, figs. 14-20; Pl. 95, figs. 28-37; Pl. 97, figs. 8-15.

Remarks. This is a widespread ostracode in the Hamilton Group. Its small size, ventral L/R overlap and greatest height near mid-length serve to distinguish it from other species of the genus.

Type material. Hypotypes GSC 110213-110216.

Occurrence. Bell, Rockport Quarry, Arkona, Hungry Hollow and Widder formations in both GSC DD1 and DD2.

Cytherellina subquadrata (Stewart), 1936

Plate 12, figures 15, 16

Bythocypris subquadrata Stewart, 1936, p. 755, 756; Pl. 101, figs. 18, 19.
Cytherellina subquadrata (Stewart). Kesling and Chilman, 1978, p. 97; Pl. 94, figs. 26-36; Pl. 96, figs. 7-16.

Remarks. This oddly shaped cytherellinid is remarkable because of its straight, square posterior margin. The anterior margin is rounded but the dorsal and ventral borders are subparallel, giving the carapace a subrectangular appearance in lateral view.

Type material. Hypotypes GSC 110217, 110218.

Occurrence. Arkona Formation in GSC DD1; Rockport Quarry, Arkona, Hungry Hollow, Widder and Ipperwash formations in GSC DD2.

Cytherellina sp.?

Plate 12, figures 17-21

Remarks. Specimens identified herein as *C.* sp.? may well include more than one taxon. They are nondescript, ovate forms for the most part, which generally exhibit L/R (?) overlap, and are smooth and unornamented.

Type material. Figured specimens GSC 110219-110223.

Occurrence. Bell, Arkona and Widder formations in GSC DD1; Rockport Quarry, Arkona and Widder formations in GSC DD2.

Genus *Menoeidina* Stewart, 1936

Type species. Menoeidina subreniformis Stewart, 1936.

Menoeidina subreniformis Stewart, 1936

Plate 12, figure 22; Plate 13, figures 1, 2

Menoeidina subreniformis Stewart, 1936, p. 762, 763; Pl. 101, figs. 22-24.
Menoeidina subreniformis Stewart. Kesling and Chilman, 1978, p. 98, 99; Pl. 64, figs. 3-24; Pl. 65, figs. 1-8; Pl. 69, figs. 9-13; Pl. 113, figs. 1, 2.

Remarks. This elongate, subrectangularly shaped menoeidinid has a prominent posterior ridge that anteriorly bounds a posterior shelf. The posterior shelf bears fine lineaments.

Type material. Hypotypes GSC 110224-110226.

Occurrence. Bell and Arkona formations in GSC DD1.

Menoeidina arcuata Turner, 1939

Plate 13, figures 3-9

Menoeidina arcuata Turner, 1939, p. 22; Pl. 1, figs. 11, 14.
Menoeidina arcuata Turner. Kesling and Chilman, 1978, p. 99, 100; Pl. 68, figs, 7-12; Pl. 69, figs. 14-25; Pl. 70, figs. 11-15; Pl. 107, figs. 15, 16; Pl. 112, fig. 5.

Remarks. This is the most widespread menoeidinid in the cored Hamilton Group. The valves taper anteriorly, and there is a prominent posterior ridge that ventrally bears a variably prominent spine. Anterior of the ridge are several prominent punctae.

Type material. Hypotypes GSC 110227-110233.

Occurrence. Bell, Rockport Quarry, Arkona and Widder formations in GSC DD1; Bell, Arkona, Hungry Hollow and Widder formations in GSC DD2.

Menoeidina paucipunctata Kesling and Chilman, 1978

Plate 13, figures 10-15

Menoeidina paucipunctata Kesling and Chilman, 1978, p. 100; Pl. 65, figs. 9-34; Pl. 68, figs. 1-6; Pl. 112, fig. 6.

Remarks. This species is very similar to *M. arcuata* Turner in that there is a similar slope to the dorsum, the posterior ridge may or may not be produced into a spine ventrally, and anterior of the ridge there are a few punctae. It is the small number of punctae that appears to have necessitated the erection of this taxon.

Type material. Hypotypes GSC 110234-110239.

Occurrence. Bell, Arkona and Widder formations in GSC DD1.

Menoeidina scopeli Coley, 1954

Plate 13, figures 16-19

Menoeidina scopeli Coley, 1954, p. 462; Pl. 53, figs. 10, 11.

Remarks. This species differs from most other menoeidinids in having a posterior ridge anterior of which there is a single row of large punctae and a faint anterior ridge parallel to the anterior margin, posterior of which there is another, single row of large punctae. Also, on the present specimens, there is a single puncta (muscle scar?) above mid-height of the valve near mid-length.

Type material. Hypotypes GSC 110240-110243.

Occurrence. Widder Formation in GSC DD1 and GSC DD2.

Superfamily QUASILLITACEA Coryell and Malkin, 1936

Family QUASILLITIDAE Coryell and Malkin, 1936

Genus *Quasillites* Coryell and Malkin, 1936

Type species. Quasillites obliquus Coryell and Malkin, 1936.

Remarks. Species of this genus probably constitute the most common elements in the ostracode fauna of the Hamilton Group. There is great variability among these species, making specific differentiation difficult. Kesling and Chilman (1978) reduced the number to four, placing a number of species in synonymy.

Quasillites concentricus (Turner) 1939

Plate 13, figures 20, 21; Plate 14, figures 1-9

Jenningsina concentrica Turner, 1939, p. 28, 29; Pl. 1, fig. 16.

Quasillites concentricus (Turner). Kesling and Chilman, 1978, p. 100-102; Pl. 48, figs. 13-24; Pl. 49, figs. 5-8; Pl. 50, figs. 23-30; Pl. 57, figs. 27-34; Pl. 60, figs. 26-28; Pl. 115, fig. 6.

Remarks. As its name suggests, *Q. concentricus* is marked by the presence of ridges concentric around the central muscle area. These ridges are joined by short ridges. The posteroventral spine is prominent but may be of varying length. Posterior and anterior platforms are present and may be denticulate.

Type material. Hypotypes GSC 110244-110254.

Occurrence. Throughout the Hamilton Group in GSC DD1 and DD2.

Quasillites fordei Coryell and Malkin, 1936

Plate 14, figures 10-18

Quasillites fordei Coryell and Malkin, 1936, p. 18, 19, fig. 38.

Quasillites fordei Coryell and Malkin. Kesling and Chilman, 1978, p. 102; Pl. 57, figs. 1-26.

Remarks. This species shows variable ornamentation, from irregularly straight to undulating ridges that may be erased at intervals to no ridges at all. The posteroventral spines are variable in length but are present as nodes or minute projections.

Type material. Hypotypes GSC 110255-110263.

Occurrence. Bell, Rockport Quarry and Arkona formations in GSC DD1; throughout the Hamilton Group in GSC DD2.

Quasillites sublunatus (Stewart), 1936

Plate 14, figures 19-23

Burlella sublunata Stewart, 1936, p. 759; Pl. 102, figs. 6-8.
Quasillites sublunatus (Stewart). Kesling and Chilman, 1978, p. 103; Pl. 48, figs. 25-36; Pl. 49, figs. 11-32; Pl. 50, figs. 1-22; Pl. 58, figs. 1-4; Pl. 113, fig. 3.

Remarks. Ornamentation on this species may vary from very indistinct to conspicuous. The main characteristic is the very large, strong posteroventral spine, the invagination of the valve surface dorsal of the spine and node-like extention of the valve surface dorsal to the posterior invagination.

Type material. Hypotypes GSC 110264-110268.

Occurrence. Bell and Arkona formations in GSC DD1; Bell, Arkona and Ipperwash formations in GSC DD2.

Quasillites spp. indet.

Plate 14, figure 24

Remarks. These taxa are based on very few individuals. They vary from elongate, smooth specimens with a minute posteroventral spine well up on the carapace to robust specimens with the ornamentation mostly effaced anteriorly and irregularly linear posteriorly, and a short, posteroventral spine.

Type material. Figured specimen GSC 110269.

Occurrence. Bell Formation in GSC DD1, Arkona and Widder formations in GSC DD2.

Genus *Glyphella* Kesling and Chilman, 1978

Type species. Glyphella reticulata Kesling and Chilman, 1978.

Glyphella reticulata Kesling and Chilman, 1978

Plate 14, figure 25; Plate 15, figures 1-3

Glyphella reticulata Kesling and Chilman, 1978, p. 104; Pl. 40, figs. 30-46; Pl. 41, figs. 35-42; Pl. 115, fig. 4.

Remarks. The coarse reticulation of this species distinguishes it from all other taxa in the collections. The central pit is elongate to ovate on the observed specimens and the dorsal pit is apparently hidden in the ornamentation. Low spines are present on the anterior and posterior dorsal corners of the valve. The posteroventral spine reported by Kesling and Chilman (1978, p. 104) may likewise be hidden in the ornamentation.

Type material. Hypotypes GSC 110270-110273.

Occurrence. Bell Formation in GSC DD1.

Genus *Jenningsina* Coryell and Malkin, 1936

Type species. Graphiodactylus catenulatus Van Pelt, 1933.

Jenningsina catenulata (Van Pelt), 1933

Plate 15, figure 4

Graphiodactylus catenulatus Van Pelt, 1933, p. 333, 334; Pl. 39, figs. 31, 32.
Jenningsina catenulata (Van Pelt). Kesling and Chilman, 1978, p. 104, 105; Pl. 59, figs. 20-24; Pl. 60, figs. 10-25; Pl. 100, figs. 1, 2.

Remarks. This species is marked by L/R overlap, a deep, circular central pit, and linear striae that are connected by cross elements giving the domicilium a reticulate ornamentation. The valve is preplete, the greatest height being anterior, and there is a mid-ventral concavity of the valves.

Type material. Hypotype GSC 110274.

Occurrence. Bell Formation in GSC DD1.

Family BUFINIDAE Sohn and Stover, 1961

Genus *Bufina* Coryell and Malkin, 1936

Type species. Bufina elata Coryell and Malkin, 1936.

Bufina abbreviata Peterson, 1966

Plate 15, figure 5

Bufina abbreviata Peterson, 1966, p. 17, 18; Pl. 3, fig. 3; Pl. 4, figs. 18-22.
Bufina abbreviata Peterson. Kesling and Chilman, 1978, p. 106; Pl. 93, figs 1-10; Pl. 97, figs. 16-26; Pl. 107, fig. 29; Pl. 119, fig. 5.

Remarks. Carapace smooth to finely punctate. The two posterior spines are well developed and the anterior arcuate ridge is short to moderately long. There is an anterior row of fine marginal denticles.

Type material. Hypotype GSC 110275.

Occurrence. Bell, Arkona and Widder formations in GSC DD1; Widder Formation in GSC DD2.

Bufina? sp.

Remarks. A few specimens of this species, found in GSC DD1, are elongate and smooth. They have the prominent posterior spines in close proximity to each other and the anterior ridge is either lacking or developed as a swollen area of the valve. There are denticles on both extremities of the valve. No specimens are figured.

Occurrence. Arkona Formation in GSC DD1.

Genus *Bythocyproidea* Stewart and Hendrix, 1945

Type species. Bythocyproidea sanduskyensis Stewart and Hendrix, 1945.

Bythocyproidea eriensis Stewart and Hendrix, 1945

Plate 15, figures 6-8

Bythocyproidea eriensis Stewart and Hendrix, 1945, p. 92, 93; Pl. 10, figs. 23-25.
Bythocyproidea eriensis Stewart and Hendrix. Kesling and Chilman, 1978, p. 106, 107; Pl. 99, figs. 11-40; Pl. 100, figs. 1-16; Pl. 101, figs. 1-8; Pl. 107, figs. 21, 22.

Remarks. The valve is postplete with L/R overlap. There is a ridge curved parallel to the posterior margin on the right valve anterior of which there are a few fine punctae.

Type material. Hypotypes GSC 110276-110278.

Occurrence. Arkona and Widder formations in GSC DD2.

Family ROPOLONELLIDAE Coryell and Malkin, 1936

Genus *Euglyphella* Warthin, 1934

Type species. Strepula sigmoidalis Jones, 1890.

Euglyphella sigmoidalis (Jones), 1890

Plate 15, figures 9-18

Strepula sigmoidalis Jones, 1890, p. 11; Pl. 2, fig. 4.
Euglyphella sigmoidalis (Jones). Kesling and Chilman, 1978, p. 112; Pl. 76, figs. 28-35; Pl. 77, figs. 16-24; Pl. 78, figs. 12-28; Pl. 79, figs. 22-26.

Remarks. This species is marked by three discrete, elongate, horizontal furrows (of which the dorsal is longest) separated by pronounced ridges. The valves vary in height but are preplete, some are shorter than others but the valve ornamentation remains constant.

Type material. Hypotypes GSC 110279-110288.

Occurrence. Throughout the Hamilton Group in GSC DD1 and GSC DD2.

Euglyphella projecta Coryell and Malkin, 1936

Plate 15, figure 19

Euglyphella projecta Coryell and Malkin, 1936, p. 7; Pl. 1, fig. 18.
Euglyphella projecta Coryell and Malkin. Kesling and Chilman, 1978, p. 109-111; Pl. 76, figs. 14-23; Pl. 77, figs. 9-15.

Remarks. This species slightly resembles *E. sigmoidalis* but has a posterior flange that bears denticles on its surface rather than projecting posteriorly. The ridges are confluent in most specimens rather than being completely separated by the horizontal furrows.

Type material. Hypotype GSC 110289.

Occurrence. Widder Formation in GSC DD2.

Euglyphella lispa Peterson, 1966

Plate 15, figures 20-22

Euglyphella lispa Peterson, 1966, p. 4; Pl. 1, figs. 7, 28, 29; Pl. 2, figs. 13-15, 18, 22; Textfig. 1.
Euglyphella lispa Peterson. Kesling and Chilman, 1978, p. 108; Pl. 76, figs. 1-4; Pl. 79, figs. 15-21.

Remarks. Distinction from other *Euglyphella* species is difficult but previous authors have considered that the effacement of the anterior and posterior dorsal spines is of specific importance.

Type material. Hypotypes GSC 110290-110292.

Occurrence. Ipperwash Formation in GSC DD2.

Superfamily THLIPSURACEA Ulrich, 1894

Family THLIPSURIDAE Ulrich, 1894

Genus *Octonaria* Jones, 1887

Type species. Octonaria octoformis Jones, 1887.

Octonaria crescentiformis Van Pelt, 1933

Plate 15, figure 23; Plate 16, figures 1, 2

Octonaria crescentiformis Van Pelt, 1933, p. 334, 335; Pl. 39, figs. 55-60.
Octonaria crescentiformis Van Pelt. Kesling and Chilman, 1978, p. 114; Pl. 87, figs. 1-6; Pl. 88, figs. 13-16.

Remarks. Valves have three distinct subparallel furrows not confluent anteroventrally and comprising distinct pits. Pronounced L/R overlap with greatest height median or slightly anterior of median.

Type material. Hypotypes GSC 110293-110295.

Occurrence. Bell and Rockport Quarry formations in GSC DD1; Widder and Ipperwash formations in GSC DD2.

Octonaria laevilitata Kesling and Kilgore, 1952

Plate 16, figures 3-10

Octonaria laevilitata Kesling and Kilgore, 1952, p. 9, 10; Pl. III, figs. 1-26, 29.
Octonaria laevilitata Kesling and Chilman, 1978, p. 114; Pl. 86, figs. 22-35; Pl. 87, figs. 7-18; Pl. 88, figs. 17-30; Pl. 89, figs. 68-71.

Remarks. This species is most distinct in that the left valve may lack ornamentation but most usually bears a strong posterior ridge parallel to the posterior margin, anterior of which is a variable row of pits. A second row of pits may be present. The right valve may bear two horizontal rows of large pits anterior of the posterior ridge.

Type material. Hypotypes GSC 110296-110303.

Occurrence. Arkona Formation in GSC DD1; Arkona and Ipperwash formations in GSC DD2.

Octonaria quadricostata Van Pelt, 1933

Plate 16, figures 11-20

Octonaria quadricostata Van Pelt, 1933, p. 336; Pl. 39, figs. 41-51.
Octonaria quadricostata Van Pelt. Kesling and Chilman, 1978, p. 114, 115; Pl. 86, figs. 11-21; Pl. 87, figs. 19-32; Pl. 88, figs. 9-12; Pl. 89, figs. 61-67.

Remarks. This is a strongly sculptured octonariid species. The ridges are sharp and the furrows are marked by large pits. The ridge marking the exterior border of the dorsal row of pits envelopes the other two furrows except anteroventrally. The posterior portion of the valve is a smooth shelf that slopes to the posterior margin. The anterior part of the valve is robust and marks the anterior continuation of the exterior ridge.

Type material. Hypotypes GSC 110304-110313.

Occurrence. Arkona Formation in GSC DD1; Arkona, Hungry Hollow, Widder and Ipperwash formations in GSC DD2.

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PLATES

PLATE 1

Figures 1-6. *Phlyctiscapha apleta* Kesling, 1954.

1. Hypotype, GSC 109944, Arkona Formation, right valve, carapace, heteromorph, x29, GSC DD2, 49.5 m.
2. Hypotype, GSC 109945, Arkona Formation, right valve, carapace, heteromorph, x30, GSC DD2, 49.5 m.
3. Hypotype, GSC 109946, Arkona Formation, left valve, carapace, tecnomorph, x67, GSC DD1, 31.3 m.
4. Hypotype, GSC 109947, Arkona Formation, right valve, carapace, tecnomorph, x61, GSC DD1, 31.3 m.
5. Hypotype, GSC 109948, Arkona Formation, left valve, carapace, tecnomorph, x75, GSC DD2, 51.3 m.
6. Hypotype, GSC 109949, Ipperwash Formation, right valve, carapace, tecnomorph, x58, GSC DD2, 2.71 m.

Figures 7-13. *Balantoides trilobata* (Turner), 1939.

7. Hypotype, GSC 109950, Arkona Formation, left valve, carapace, x100, GSC DD1, 51.6 m.
8. Hypotype, GSC 109951, Bell Formation, right valve, carapace, x91, GSC DD1, 68 m.
9. Hypotype, GSC 109952, Bell Formation, right valve, carapace, x91, GSC DD1, 68.9 m.
10. Hypotype, GSC 109953, Arkona Formation, right valve, carapace, x113, GSC DD2, 34 m.
11. Hypotype, GSC 109954, Arkona Formation, left valve, carapace, x70, GSC DD1, 47.7 m.
12. Hypotype, GSC 109955, Arkona Formation, right valve, carapace, x100, GSC DD2, 58.8 m.
13. Hypotype, GSC 109956, Arkona Formation, right valve, carapace, x100, GSC DD1, 34 m.

Figure 14. *Aechmina crenulata* Stewart, 1937.

14. Hypotype, GSC 109957, Arkona Formation, ventral view, carapace, x90, GSC DD1, 33.7 m.

Figure 15-17. *Aechmina choanobasota* Kesling, 1953.

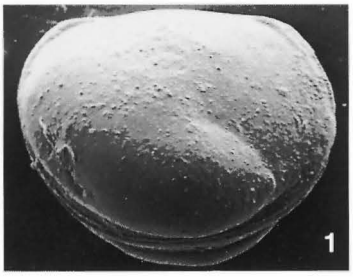
15. Hypotype, GSC 109958, Arkona Formation, right valve, carapace, x73, GSC DD2, 44.4 m.
16. Hypotype, GSC 109959, Arkona Formation, left valve, carapace, x90, GSC DD2, 34 m.
17. Hypotype, GSC 109960, Arkona Formation, ventral view, carapace, x79, GSC DD2, 34 m.

Figure 18. *Aechmina* sp.

18. Figured specimen, GSC 109961, Arkona Formation, right valve, carapace, x85, GSC DD2, 37.6 m.

Figure 19-22. *Aechminaria hormathota* Kesling, 1953.

19. Hypotype, GSC 109962, Widder Formation, right valve, carapace, x75, GSC DD2, 21.3 m.
20. Hypotype, GSC 109963, Widder Formation, right valve, carapace, x58, GSC DD2, 22.2 m.
21. Hypotype, GSC 109964, Arkona Formation, left valve, carapace, x45, GSC DD2, 33.1 m.
22. Hypotype, GSC 109965, Hungry Hollow Formation, left valve, carapace, x48, GSC DD2, 30.1 m.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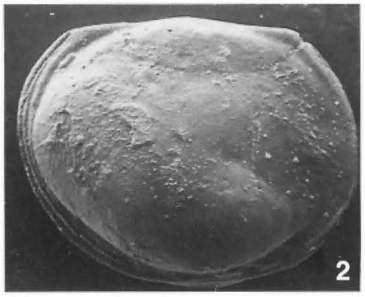
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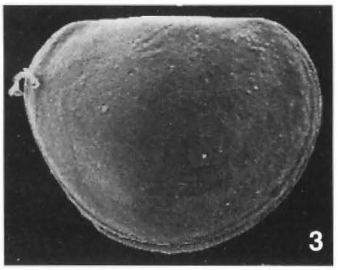
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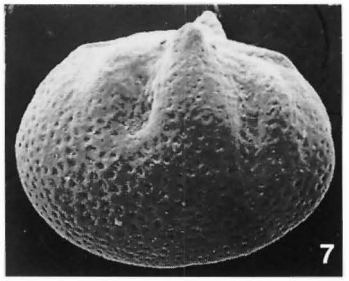
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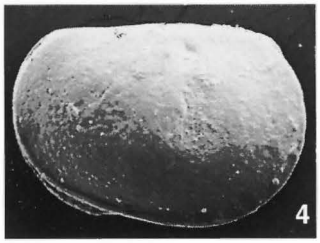
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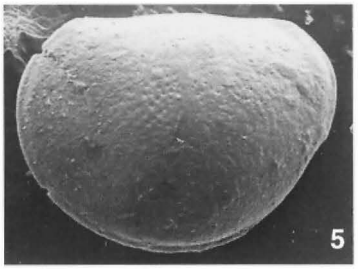
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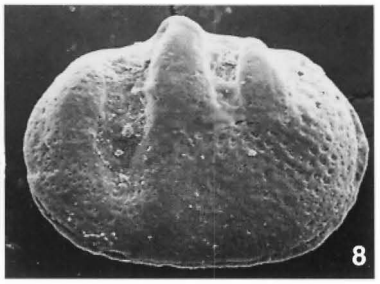
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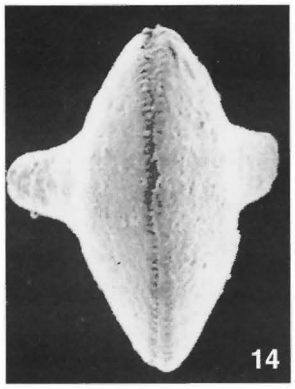
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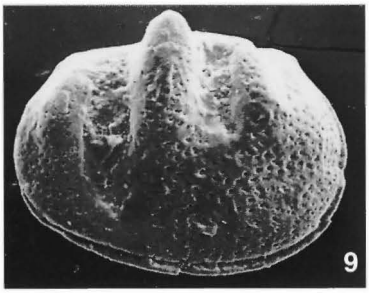
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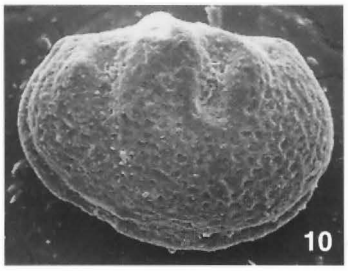
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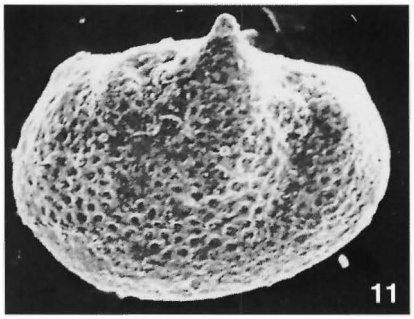
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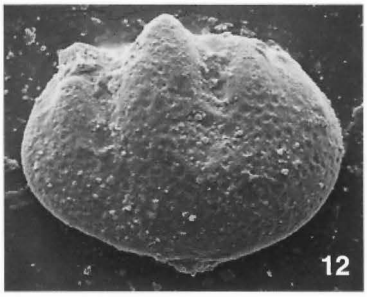
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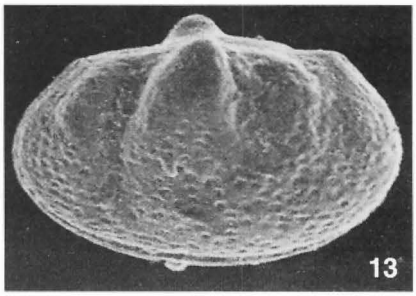
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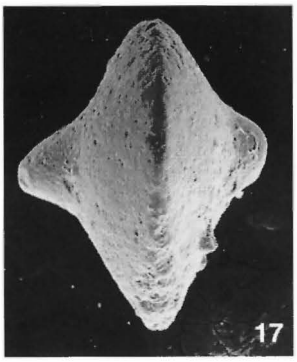
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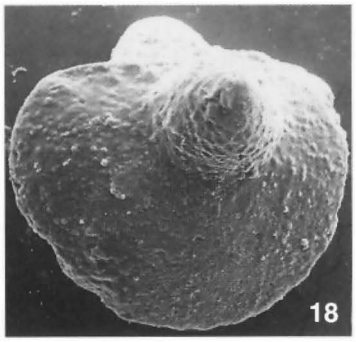
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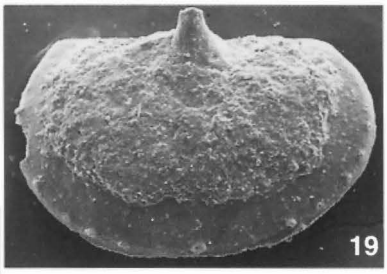
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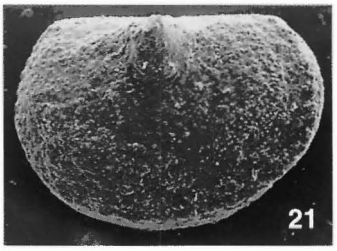
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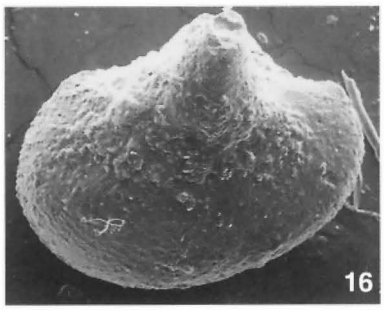
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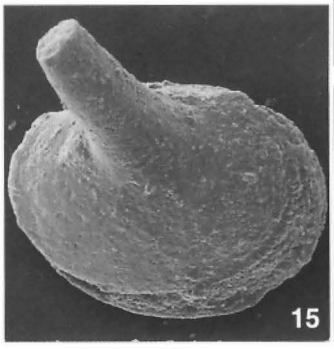
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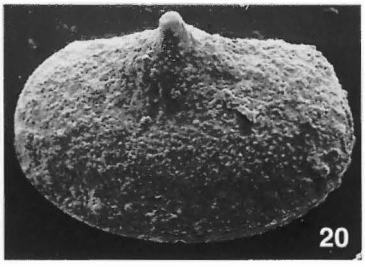
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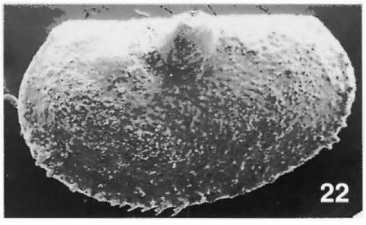
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PLATE 2

Figures 1, 2. *Cornigella immotipedata* Kesling, 1953.

1. Hypotype, GSC 109966, Arkona Formation, left valve, carapace, x100, GSC DD2, 47.0 m.
2. Hypotype, GSC 109967, Arkona Formation, left valve, carapace, x100, GSC DD2, 49.3 m.

Figure 3, 4. *Cornigella* n. sp.?

3. Figured specimen, GSC 109968, Arkona Formation, right valve, carapace, GSC DD1, 50.1 m.
4. Figured specimen, GSC 109969, Arkona Formation, right valve, carapace, GSC DD1, 36.7 m.

Figures 5-7. *Stictobollia alethaae* (Coley), 1954.

5. Hypotype, GSC 109970, Arkona Formation, left valve, carapace, x100, GSC DD1, 33.7 m.
6. Hypotype, GSC 109971, Arkona Formation, left valve, carapace, x100, GSC DD1, 48.3 m.
7. Hypotype, GSC 109972, Arkona Formation, right valve, carapace, x104, GSC DD1, 55.6 m.

Figures 8-11. *Ulrichia conradi* Jones, 1890.

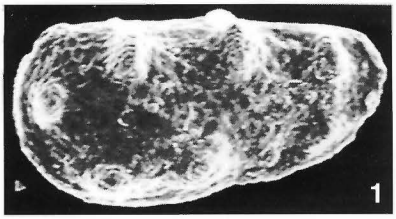
8. Hypotype, GSC 109973, Widder Formation, left valve, carapace, x71, GSC DD2, 17.4 m.
9. Hypotype, GSC 109974, Rockport Quarry Formation, left valve, carapace, x81, GSC DD2, 64.8 m.
10. Hypotype, GSC 109975, Rockport Quarry Formation, left valve, carapace, x62, GSC DD2, 65.3 m.
11. Hypotype, GSC 109976, Widder Formation, left valve, skewed carapace, x62, GSC DD2, 24.4 m.

Figures 12, 13. *Ulrichia fastidiosa* Kesling and Chilman, 1978.

12. Hypotype, GSC 109977, Arkona Formation, left valve, carapace, x85, GSC DD1, 31.3 m.
13. Hypotype, GSC 109978, Arkona Formation, left valve, carapace, x70, GSC DD1, 24.7 m.

Figures 14-21. *Ulrichia fragilis* Warthin, 1934.

14. Hypotype, GSC 109979, Arkona Formation, right valve, carapace, x105, GSC DD2, 37 m.
15. Hypotype, GSC 109980, Arkona Formation, left valve, carapace, x110, GSC DD2, 37.3 m.
16. Hypotype, GSC 109981, Widder Formation, right valve, carapace, x93, GSC DD2, 20.1 m.
17. Hypotype, GSC 109982, Widder Formation, right valve, carapace, x81, GSC DD1, 9.9 m.
18. Hypotype, GSC 109983, Widder Formation, left valve, carapace, x81, GSC DD1, 9 m.
19. Hypotype, GSC 109984, Widder Formation, right valve, carapace, x88, GSC DD2, 23.8 m.
20. Hypotype, GSC 109985, Rockport Quarry Formation, right valve, carapace, x90, GSC DD2, 65.5 m.
21. Hypotype, GSC 109986, Widder Formation, left valve, carapace, x93, GSC DD2, 20.4 m.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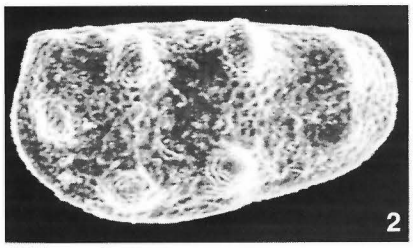
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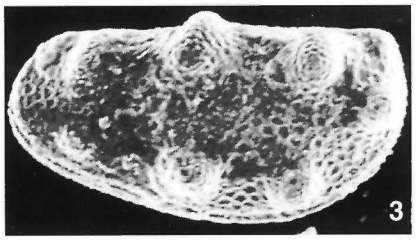
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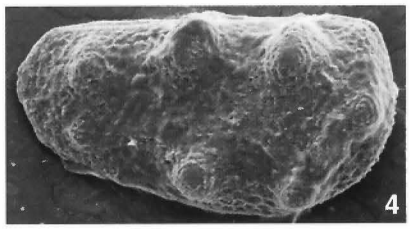
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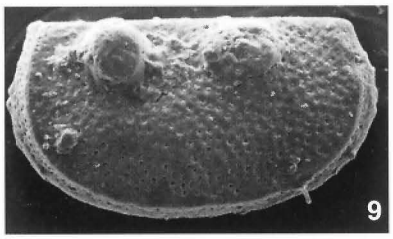
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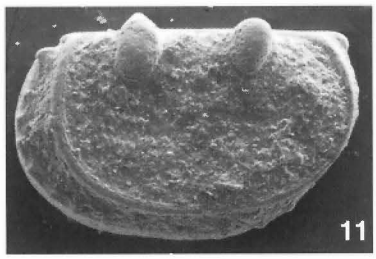
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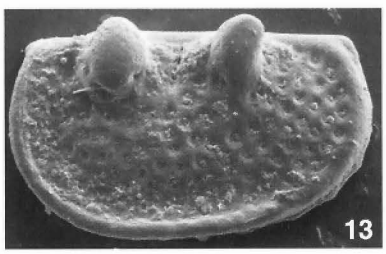
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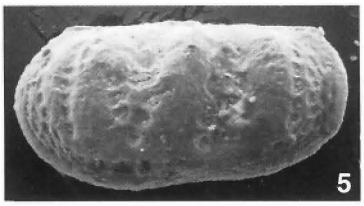
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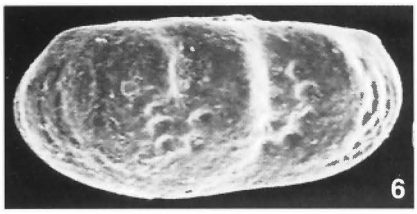
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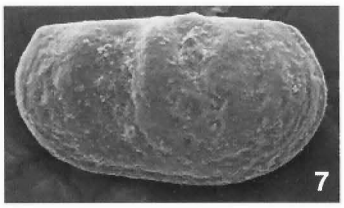
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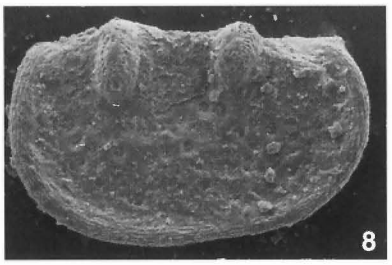
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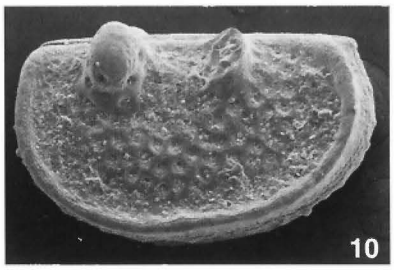
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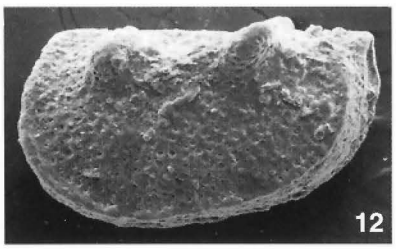
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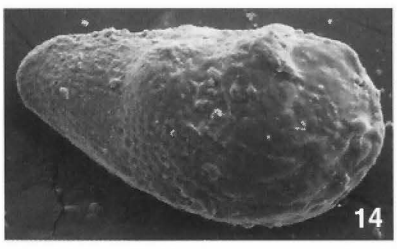
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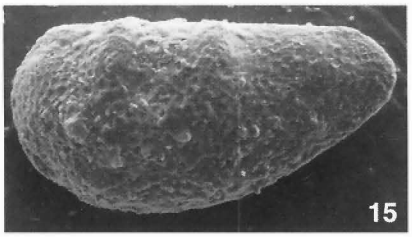
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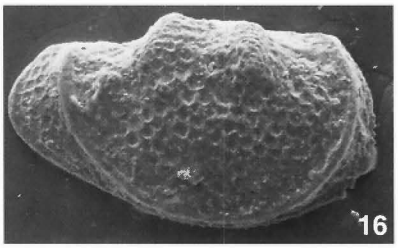
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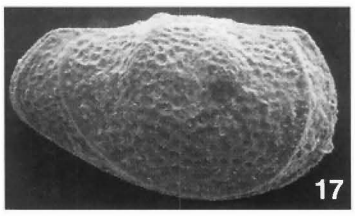
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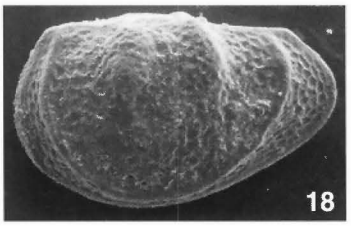
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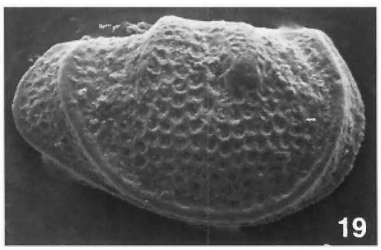
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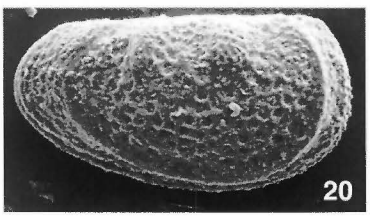
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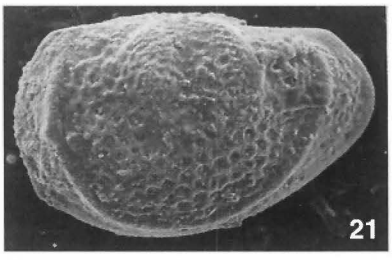
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PLATE 3

Figure 1. *Ulrichia fragilis* Warthin, 1943.

1. Hypotype, GSC 109987, Widder Formation, left valve, carapace, x98, GSC DD2, 16.8 m.

Figures 2-9. *Ulrichia illinearis* Kesling, 1953.

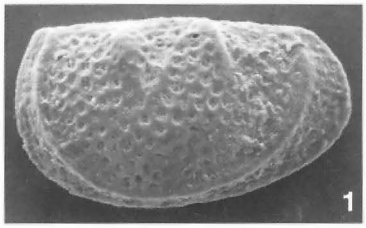
2. Hypotype, GSC 109988, Arkona Formation, right valve, carapace, x90, GSC DD1, 41.7 m.
3. Hypotype, GSC 109989, Arkona Formation, right valve, carapace, x104, GSC DD1, 42.3 m.
4. Hypotype, GSC 109990, Arkona Formation, left valve, carapace, x93, GSC DD1, 34 m.
5. Hypotype, GSC 109991, Arkona Formation, right valve, carapace, x81, GSC DD1, 33.7 m.
6. Hypotype, GSC 109992, Arkona Formation, left valve, carapace, x104, GSC DD1, 42.3 m.
7. Hypotype, GSC 109993, Arkona Formation, left valve, carapace, x98, GSC DD1, 34 m.
8. Hypotype, GSC 109994, Arkona Formation, right valve, carapace, x91, GSC DD1, 34 m.
9. Hypotype, GSC 109995, Arkona Formation, left valve, carapace, x111, GSC DD1, 43.2 m.

Figures 10-18. *Ulrichia spinifera* Coryell and Malkin, 1936.

10. Hypotype, GSC 109996, Arkona Formation, right valve, carapace, x70, GSC DD1, 42.6 m.
11. Hypotype, GSC 109997, Arkona Formation, right valve, carapace, x70, GSC DD1, 44.4 m.
12. Hypotype, GSC 109998, Arkona Formation, left valve, carapace, x60, GSC DD1, 42.3 m.
13. Hypotype, GSC 109999, Arkona Formation, left valve, carapace, x70, GSC DD1, 37 m.
14. Hypotype, GSC 110000, Arkona Formation, right valve, carapace, x60, GSC DD1, 41.7 m.
15. Hypotype, GSC 110001, Rockport Quarry Formation, right valve, carapace, x100, GSC DD1, 63.8 m.
16. Hypotype, GSC 110002, Bell Formation, left valve, carapace, x100, GSC DD1, 64.1 m.
17. Hypotype, GSC 110003, Arkona Formation, left valve, carapace, x80, GSC DD1, 47.4 m.
18. Hypotype, GSC 110004, Bell Formation, left valve, carapace, x65, GSC DD1, 65.9 m.

Figures 19-21. *Kirkbyella* (*Kirkbyella*) *bellipuncta* (Van Pelt), 1933.

19. Hypotype, GSC 110005, Arkona Formation, right valve, carapace, x85, GSC DD1, 55 m.
20. Hypotype, GSC 110006, Arkona Formation, left valve, carapace, x81, GSC DD2, 58.9 m.
21. Hypotype, GSC 110007, Arkona Formation, left valve, carapace, x85, GSC DD1, 55 m.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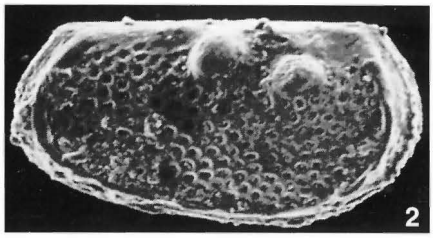
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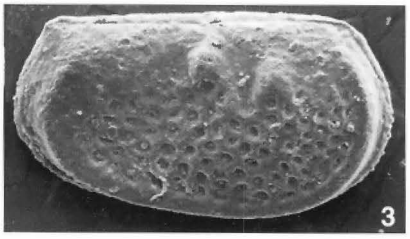
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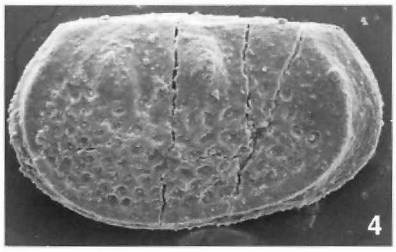
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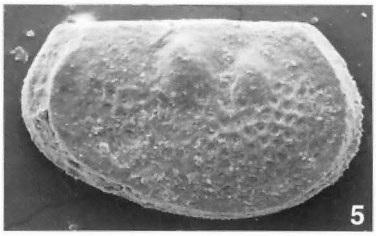
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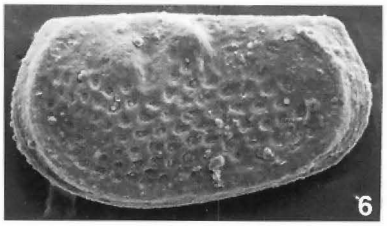
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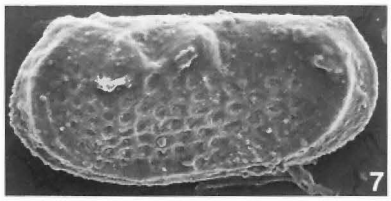
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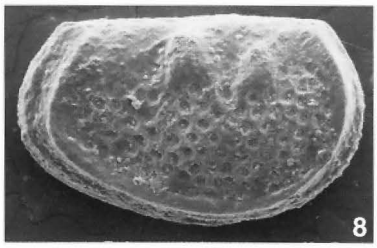
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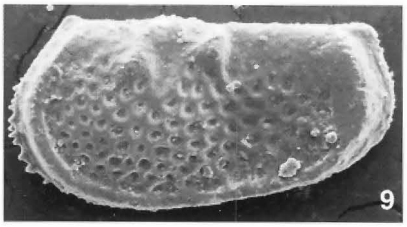
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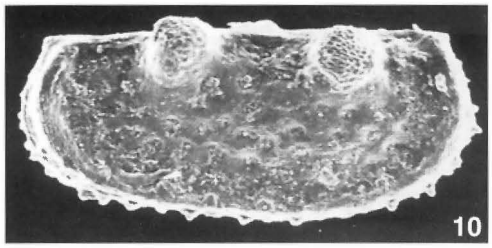
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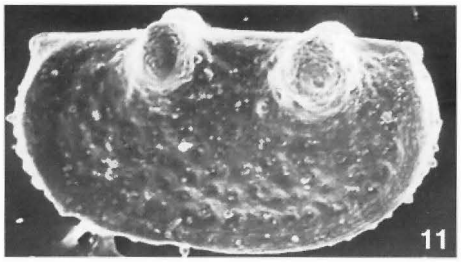
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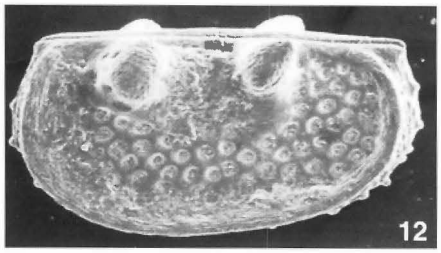
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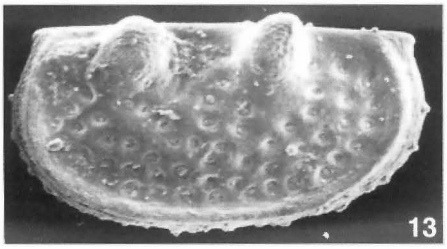
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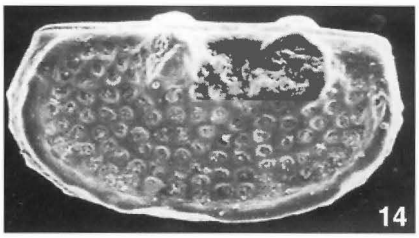
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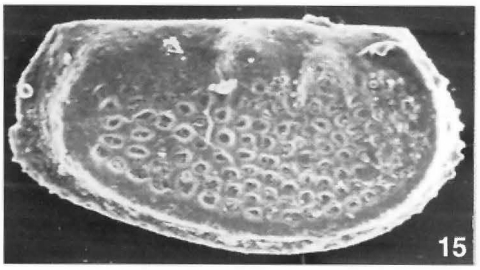
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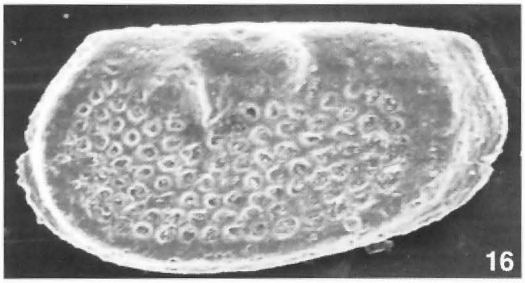
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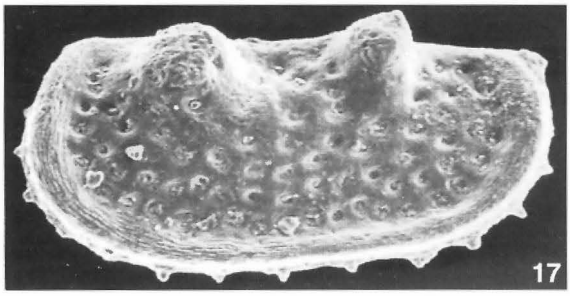
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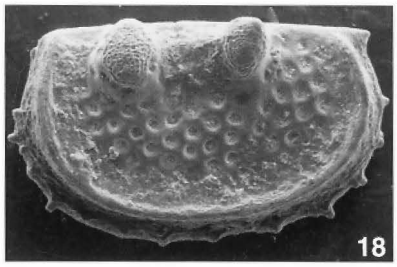
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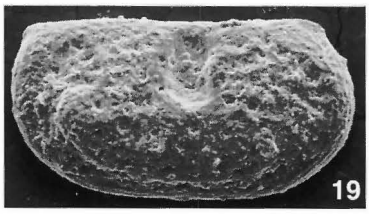
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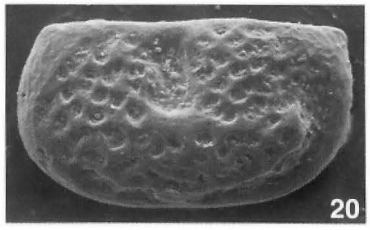
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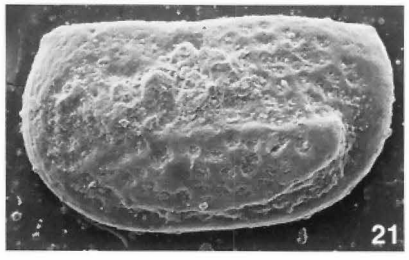
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PLATE 4

Figures 1-4. *Kirkbyella* (*Kirkbyella*) *bellipuncta* (Van Pelt), 1933.

1. Hypotype, GSC 110008, Arkona Formation, right valve, carapace, x77, GSC DD1, 53.8 m.
2. Hypotype, GSC 110009, Arkona Formation, left valve, carapace, x75, GSC DD2, 58.9 m.
3. Hypotype, GSC 110010, Widder Formation, right valve, carapace, x72, GSC DD2, 14.7 m.
4. Hypotype, GSC 110011, Ipperwash Formation, left valve, carapace, x91, GSC DD2, 6 m.

Figures 5, 6. *Kirkbyella* (*Kirkbyella*) sp.

5. Figured specimen, GSC 110012, Bell Formation, right valve, carapace, x80, GSC DD1, 73.3 m.
6. Figured specimen, GSC 110013, Rockport Quarry Formation, right valve, carapace, x90, GSC DD1, 63.8 m.

Figure 7. *Kirkbyella* (*Berdanella*) *unicornis* Coryell and Malkin, 1936.

7. Hypotype, GSC 110014, Hungry Hollow Formation, right valve, carapace, x86, GSC DD2, 30.4 m.

Figures 8-10. *Richina subcircularis* Coryell and Malkin, 1936.

8. Hypotype, GSC 110015, Widder Formation, right valve, carapace, x55, GSC DD2, 21 m.
9. Hypotype, GSC 110016, Widder Formation, left valve, carapace, x58, GSC DD2, 20.1 m.
10. Hypotype, GSC 110017, Ipperwash Formation, right valve, carapace, x59, GSC DD2, 6.6 m.

Figure 11. *Richina trinodosa* Kesling and Chilman, 1978.

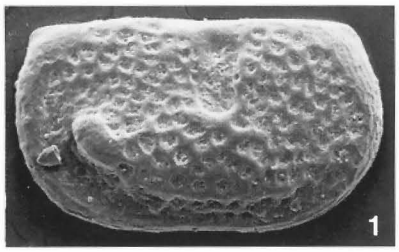
11. Hypotype, GSC 110018, Arkona Formation, right valve, carapace, x53, GSC DD2, 58.6 m.

Figure 12. *Richina*? sp.

12. Hypotype, GSC 110019, Arkona Formation, right valve, carapace, x89, GSC DD2, 45.6 m.

Figures 13-23. *Ctenoloculina cicatricosa* (Warthin), 1934.

13. Hypotype, GSC 110020, Hungry Hollow Formation, left valve, carapace, heteromorph, x39, GSC DD2, 29.8 m.
14. Hypotype, GSC 110021, Widder Formation, right valve, carapace, heteromorph, x60, GSC DD2, 15.6 m.
15. Hypotype, GSC 110022, Arkona Formation, ventral view, carapace, heteromorph, x31, GSC DD2, 33.7 m.
16. Hypotype, GSC 110023, Ipperwash Formation, right valve, carapace, heteromorph, x43, GSC DD2, 5.7 m.
17. Hypotype, GSC 110024, Arkona Formation, right valve, carapace, heteromorph, x40, GSC DD2, 37.6 m.
18. Hypotype, GSC 110025, Arkona Formation, right valve, carapace, tecnomorph?, x71, GSC DD1, 17.4 m.
19. Hypotype, GSC 110026, Bell Formation, left valve, carapace, tecnomorph, x42, GSC DD1, 73.4 m.
20. Hypotype, GSC 110027, Arkona Formation, left valve, carapace, tecnomorph, x66, GSC DD1, 16.2 m.
21. Hypotype, GSC 110028, Arkona Formation, right valve, carapace, tecnomorph?, x72, GSC DD1, 17.4 m.
22. Hypotype, GSC 110029, Arkona Formation, left valve, carapace, tecnomorph, x40, GSC DD2, 33.4 m.
23. Hypotype, GSC 110030, Arkona Formation, left valve, carapace, tecnomorph, x70, GSC DD2, 34.6 m.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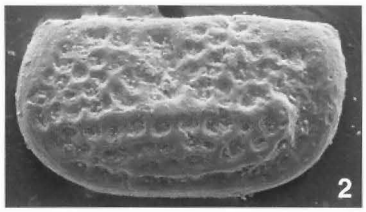
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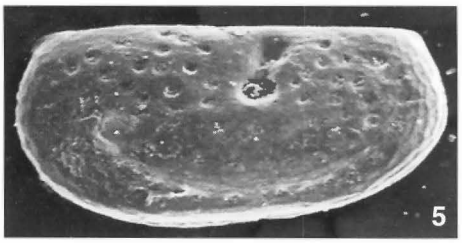
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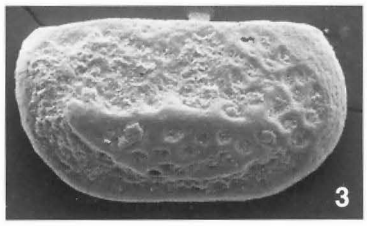
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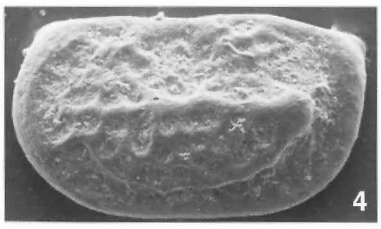
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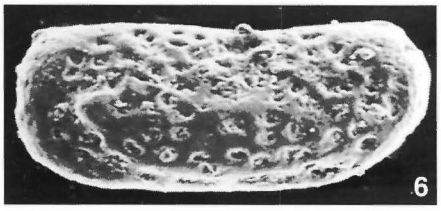
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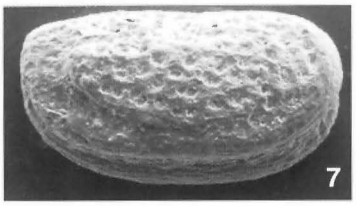
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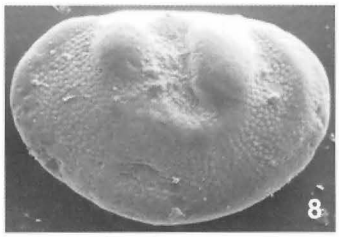
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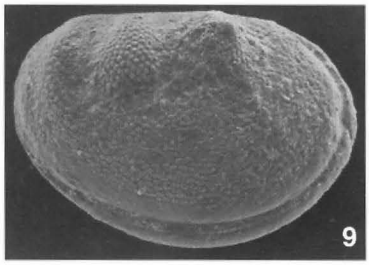
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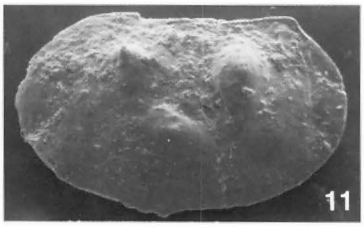
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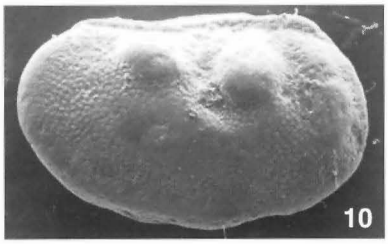
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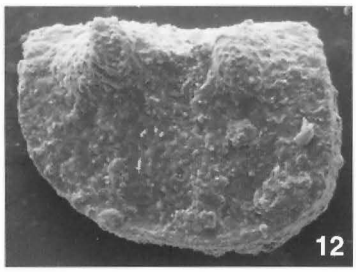
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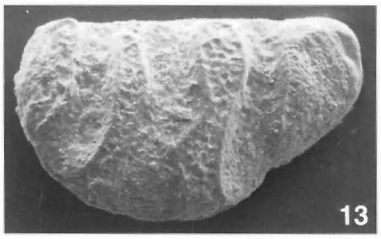
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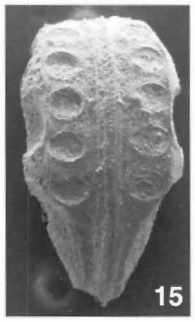
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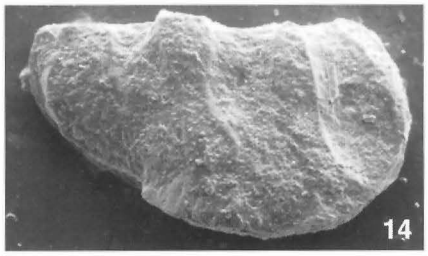
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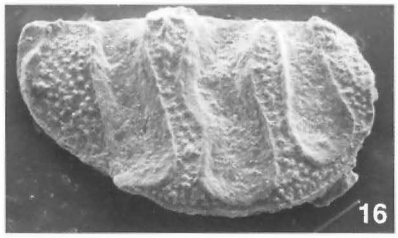
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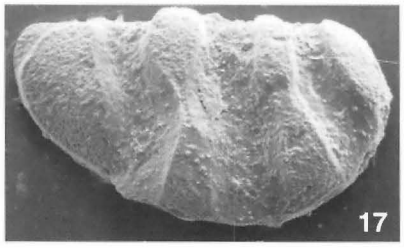
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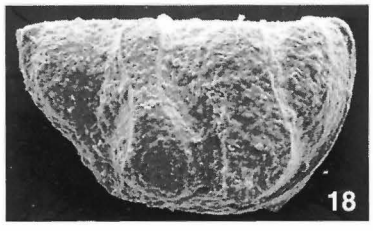
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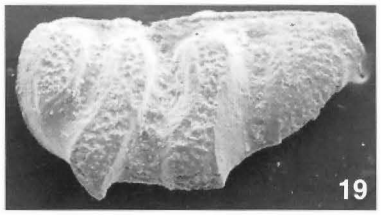
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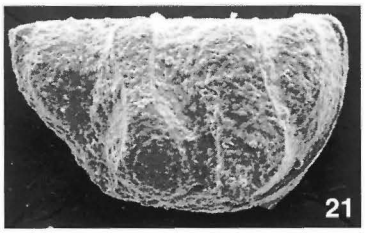
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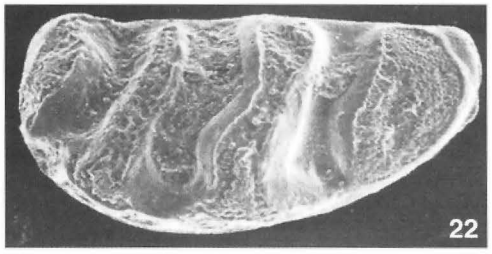
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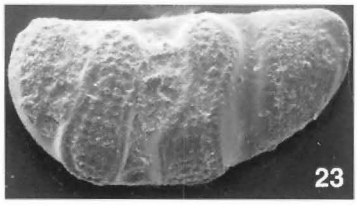
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PLATE 5

Figures 1-4. *Ctenoloculina cicatricosa* (Warthin), 1934.

1. Hypotype, GSC 110031, Arkona Formation, right valve, carapace, tecnomorph, x51, GSC DD2, 43.2 m.
2. Hypotype, GSC 110032, Arkona Formation, right valve, carapace, tecnomorph, x58, GSC DD1, 42.6 m.
3. Hypotype, GSC 110033, Rockport Quarry Formation, right valve, carapace, tecnomorph, x42, GSC DD2, 68.0 m.
4. Hypotype, GSC 110034, Arkona Formation, ventral view, carapace, tecnomorph, x51, GSC DD1, 38.8 m.

Figures 5-13. *Ctenoloculina acanthina* Kesling, 1953.

5. Hypotype, GSC 110035, Arkona Formation, right valve, carapace, heteromorph, x51, GSC DD1, 34 m.
6. Hypotype, GSC 110036, Arkona Formation, right valve, carapace, heteromorph, x48, GSC DD1, 19.2 m.
7. Hypotype, GSC 110037, Arkona Formation, right valve, carapace, heteromorph, x46, GSC DD2, 60 m.
8. Hypotype, GSC 110038, Arkona Formation, right valve, carapace, heteromorph, x47, GSC DD1, 18.6 m.
9. Hypotype, GSC 110039, Arkona Formation, right valve, carapace, tecnomorph, x71, GSC DD2, 49.5 m.
10. Hypotype, GSC 110040, Arkona Formation, right valve, carapace, tecnomorph, x74, GSC DD1, 34 m.
11. Hypotype, GSC 110041, Arkona Formation, left valve, carapace, tecnomorph, x65, GSC DD1, 53.0 m.
12. Hypotype, GSC 110042, Arkona Formation, left valve, carapace, tecnomorph, x62, GSC DD1, 42.9 m.
13. Hypotype, GSC 110043, Arkona Formation, right valve, carapace, tecnomorph, x60, GSC DD1, 32.2 m.

Figures 14-17. *Ctenoloculina* n. sp.?

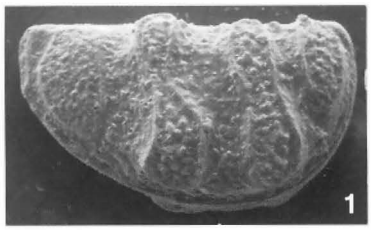
14. Figured specimen, GSC 110044, Ipperwash Formation, right valve, carapace, tecnomorph, x58, GSC DD2, 8.7 m.
15. Figured specimen, GSC 110045, Arkona Formation, right valve, carapace, tecnomorph, x41, GSC DD2, 36.1 m.
16. Figured specimen, GSC 110046, Arkona Formation, right valve, carapace, tecnomorph, x50, GSC DD1, 52.5 m.
17. Figured specimen, GSC 110047, Arkona Formation, right valve, carapace, tecnomorph, x60, GSC DD1, 51.3 m.

Figure 18. *Ctenoloculina* sp.

18. Figured specimen, GSC 110048, Arkona Formation, right valve, carapace, heteromorph, x48, GSC DD2, 43.2 m.

Figure 19-23. *Subligaculum calcaratum* Kesling, 1953.

19. Hypotype, GSC 110049, Arkona Formation, left valve, carapace, tecnomorph, x86, GSC DD1, 19.2 m.
20. Hypotype, GSC 110050, Arkona Formation, left valve, carapace, tecnomorph, x79, GSC DD1, 20.1 m.
21. Hypotype, GSC 110051, Arkona Formation, right valve, carapace, heteromorph, x73, GSC DD1, 19.2 m.
22. Hypotype, GSC 110052, Arkona Formation, left valve, carapace, heteromorph, x62, GSC DD1, 18.6 m.
23. Hypotype, GSC 110053, Arkona Formation, left valve, carapace, heteromorph, x60, GSC DD1, 34 m.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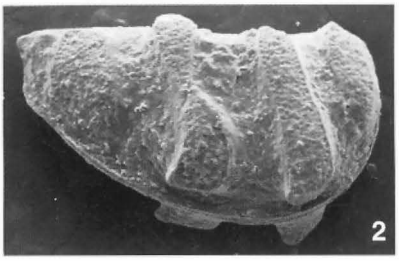
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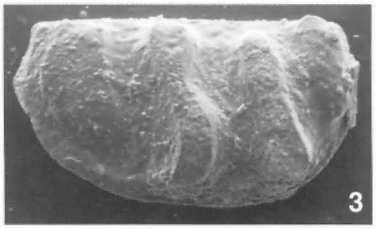
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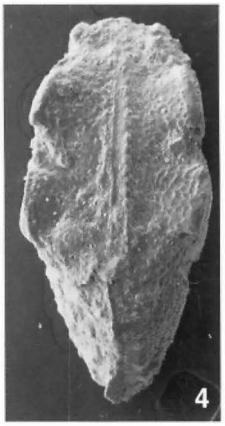
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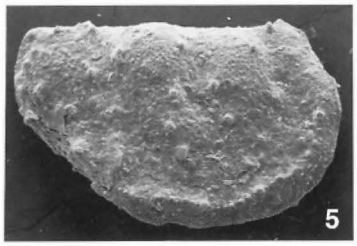
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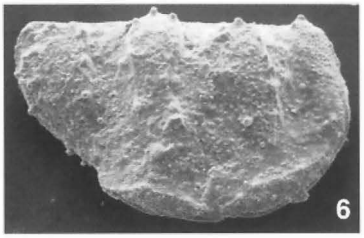
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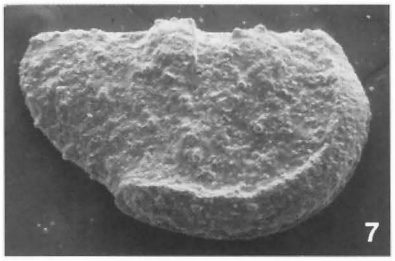
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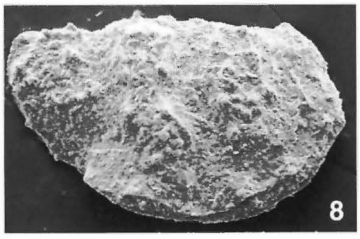
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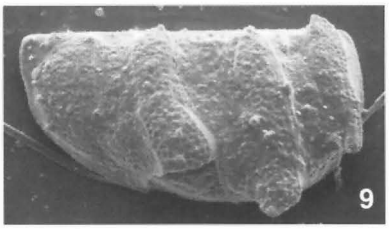
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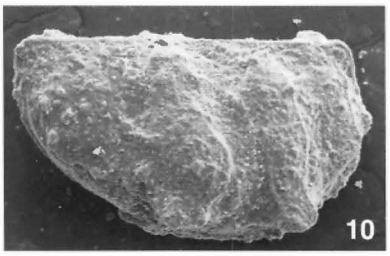
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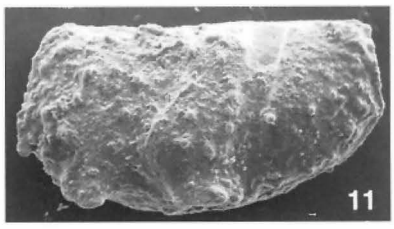
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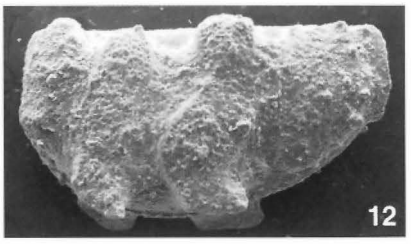
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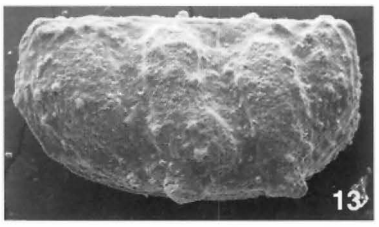
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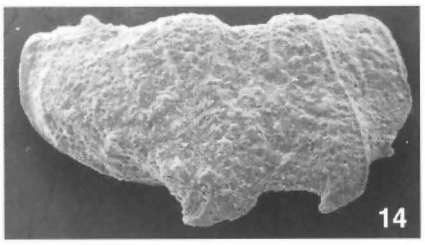
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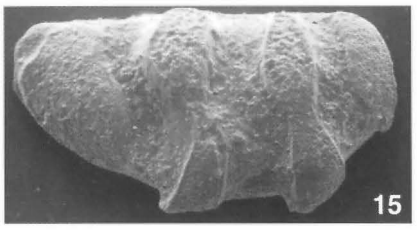
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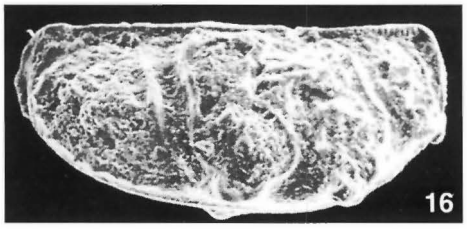
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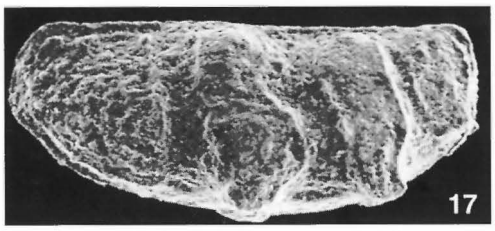
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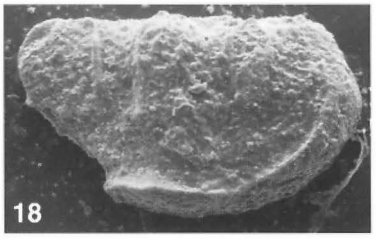
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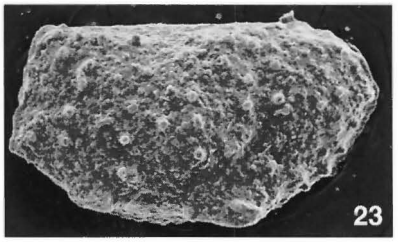
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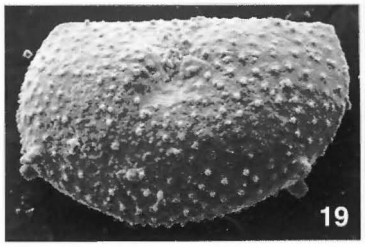
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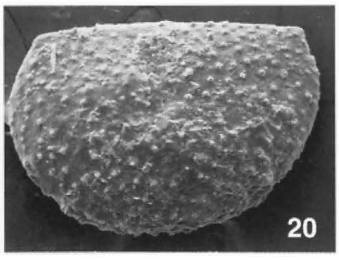
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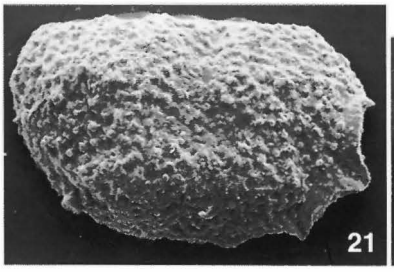
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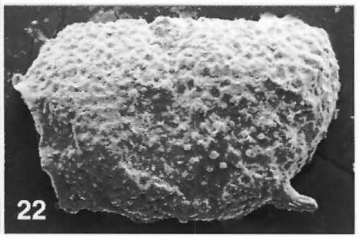
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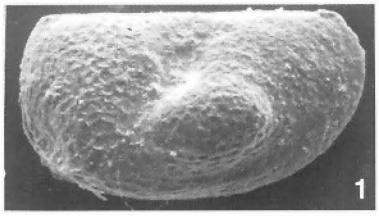
PLATE 6

Figures 1-13. *Tetrasacculus bilobus* Stewart, 1936.

1. Hypotype, GSC 110054, Widder Formation, left valve, carapace, tecnomorph, x86, GSC DD2, 20.1 m.
2. Hypotype, GSC 110055, Widder Formation, left valve, carapace, tecnomorph, x75, GSC DD1, 8.7 m.
3. Hypotype, GSC 110056, Arkona Formation, right valve, carapace, tecnomorph, x98, GSC DD1, 46.8 m.
4. Hypotype, GSC 110057, Widder Formation, dorsal view, carapace, heteromorph, x66, GSC DD2, 19.8 m.
5. Hypotype, GSC 110058, Widder Formation, left valve, carapace, tecnomorph, x78, GSC DD2, 24.1 m.
6. Hypotype, GSC 110059, Widder Formation, left valve, carapace, heteromorph, x65, GSC DD1, 9 m.
7. Hypotype, GSC 110060, Arkona Formation, right valve, carapace, heteromorph, x70, GSC DD1, 46.8 m.
8. Hypotype, GSC 110061, Rockport Quarry Formation, left valve, carapace, heteromorph, x75, GSC DD2, 68.0 m.
9. Hypotype, GSC 110062, Widder Formation, ventral view, left valve, heteromorph, x60, GSC DD2, 19.8 m.
10. Hypotype, GSC 110063, Widder Formation, ventral view, carapace, heteromorph, x69, GSC DD2, 19.8 m.
11. Hypotype, GSC 110064, Bell Formation, left valve, carapace, heteromorph, x72, GSC DD2, 81.2 m.
12. Hypotype, GSC 110065, Bell Formation, ventral view, carapace, heteromorph, x68, GSC DD2, 81 m.
13. Hypotype, GSC 110066, Arkona Formation, right valve, carapace, tecnomorph?, x91, GSC DD2, 35.2 m.

Figures 14-25. *Falsipollex lativelatus* (Kesling and McMillan), 1951.

14. Hypotype, GSC 110067, Arkona Formation, left valve, carapace, tecnomorph, x50, GSC DD2, 34 m.
15. Hypotype, GSC 110068, Ipperwash Formation, right valve, carapace, tecnomorph, x45, GSC DD2, 1.2 m.
16. Hypotype, GSC 110069, Widder Formation, right valve, carapace, tecnomorph, x47, GSC DD2, 21 m.
17. Hypotype, GSC 110070, Widder Formation, right valve, carapace, tecnomorph, x75, GSC DD2, 24.4 m.
18. Hypotype, GSC 110071, Widder Formation, right valve, carapace, tecnomorph, x71, GSC DD2, 22.5 m.
19. Hypotype, GSC 110072, Widder Formation, left valve, carapace, tecnomorph, x56, GSC DD2, 20.7 m.
20. Hypotype, GSC 110073, Widder Formation, right valve, carapace, tecnomorph, x46, GSC DD2, 25 m.
21. Hypotype, GSC 110074, Arkona Formation, right valve, carapace, tecnomorph, x71, GSC DD2, 44.4 m.
22. Hypotype, GSC 110075, Bell Formation, right valve, carapace, tecnomorph, x68, GSC DD1, 73.1 m.
23. Hypotype, GSC 110076, Widder Formation, left valve, carapace, tecnomorph, x36, GSC DD2, 21.9 m.
24. Hypotype, GSC 110077, Arkona Formation, right valve, carapace, tecnomorph, x57, GSC DD1, 42.6 m.
25. Hypotype, GSC 110078, Widder Formation, right valve, carapace, heteromorph, x38, GSC DD2, 21 m.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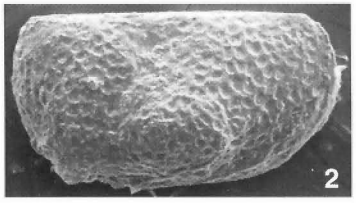
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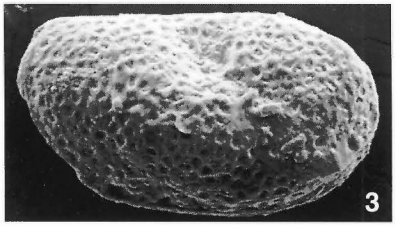
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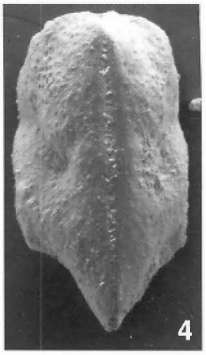
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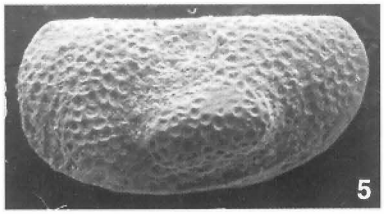
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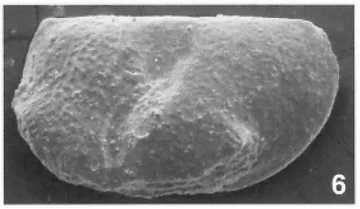
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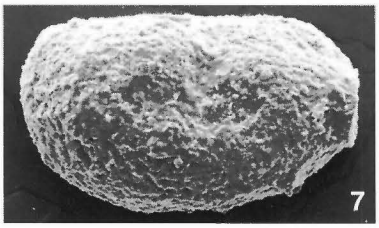
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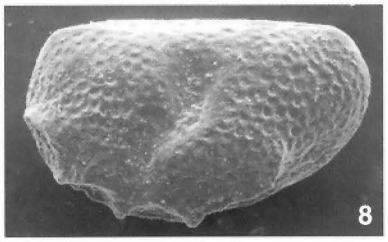
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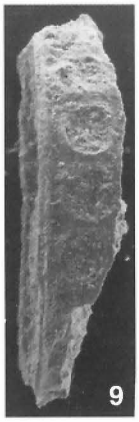
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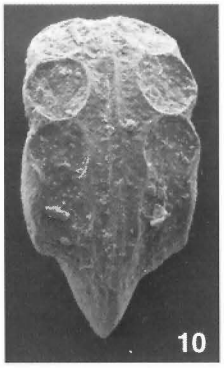
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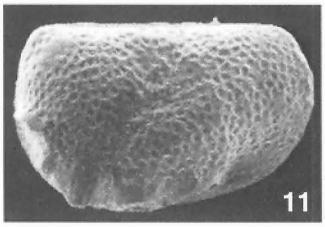
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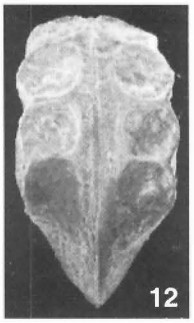
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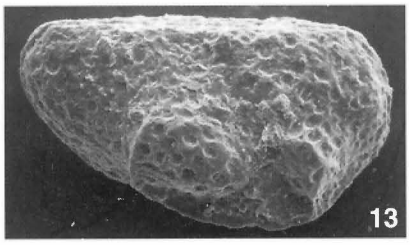
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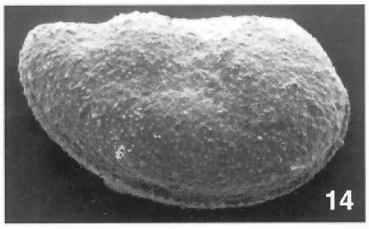
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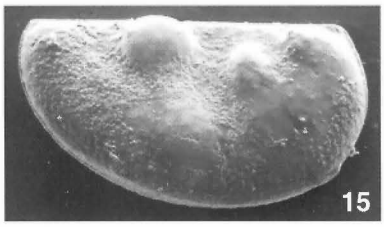
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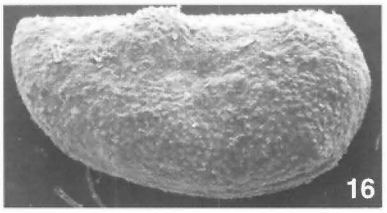
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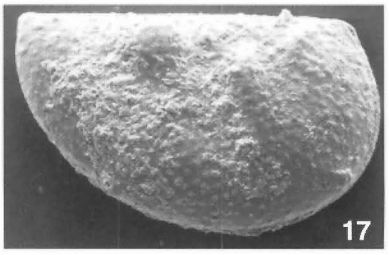
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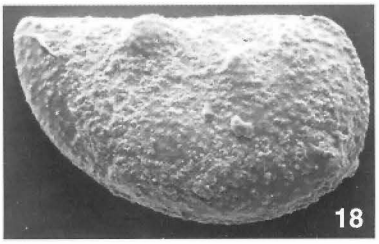
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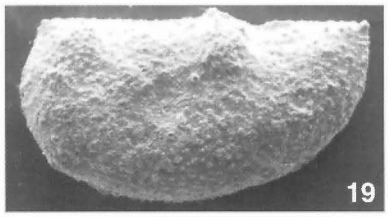
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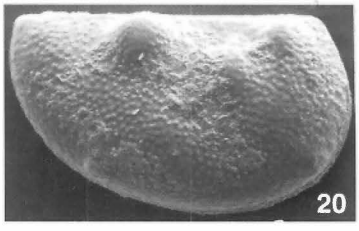
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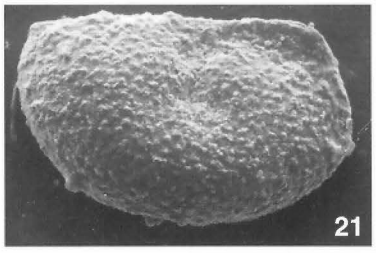
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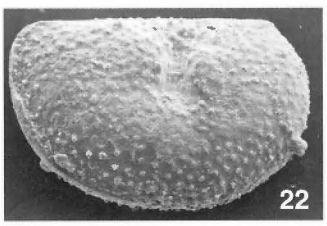
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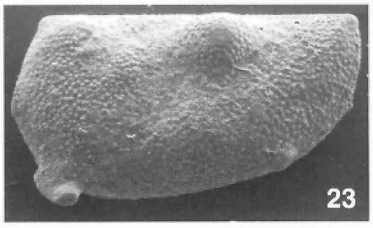
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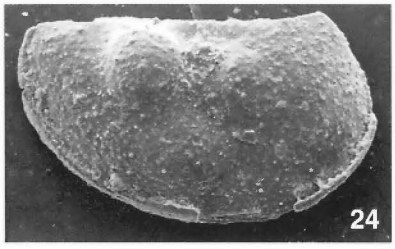
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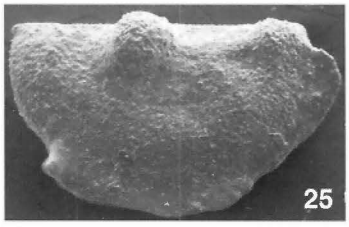
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PLATE 7

Figures 1-5. *Falsipollex valgus* Kesling, 1952.

1. Hypotype, GSC 110079, Arkona Formation, right valve, carapace, heteromorph, x31, GSC DD2, 37.9 m.
2. Hypotype, GSC 110080, Arkona Formation, right valve, carapace, tecnomorph, x48 GSC DD1, 42.9 m.
3. Hypotype, GSC 110081, Arkona Formation, left valve, carapace, heteromorph, x45, GSC DD2, 34.9 m.
4. Hypotype, GSC 110082, Bell Formation, right valve, carapace, tecnomorph, x50, GSC DD1, 64.1 m.
5. Hypotype, GSC 110083, Bell Formation, left valve, carapace, tecnomorph, x50, GSC DD1, 64.1 m.

Figure 6. *Falsipollex*? sp.

6. Figured specimen, GSC 110084, Hungry Hollow Formation, right valve, carapace, tecnomorph, x71, GSC DD2, 30.4 m.

Figure 7-11. *Hollinella* (*Keslingella*) *pumila* Kesling, 1952.

7. Hypotype, GSC 110085, Bell Formation, right valve, carapace, tecnomorph, x28, GSC DD2, 81.2 m.
8. Hypotype, GSC 110086, Hungry Hollow Formation, right valve, carapace, tecnomorph, x59, GSC DD2, 30.4 m.
9. Hypotype, GSC 110087, Hungry Hollow Formation, right valve, carapace, tecnomorph, x55, GSC DD2, 30.1 m.
10. Hypotype, GSC 110088, Arkona Formation, left valve, carapace, tecnomorph, x35, GSC DD2, 60.9 m.
11. Hypotype, GSC 110089, Hungry Hollow Formation, right valve, carapace, tecnomorph, x55, GSC DD2, 30.1 m.

Figures 12-15. *Labrosavelum sphaericum* Kesling and Chilman, 1987.

12. Hypotype, GSC 110090, Ipperwash Formation, left valve, carapace, tecnomorph?, x31, GSC DD2, 6.31 m.
13. Hypotype, GSC 110091, Ipperwash Formation, right valve, carapace, heteromorph, x32, GSC DD2, 4.51 m.
14. Hypotype, GSC 110092, Ipperwash Formation, left valve, carapace, heteromorph, x31, GSC DD2, 5.71 m.
15. Hypotype, GSC 110093, Widder Formation, right valve, carapace, tecnomorph?, x30, GSC DD2, 15 m.

Figures 16, 17. *Doraclatum conatum* (Coryell and Malkin), 1936.

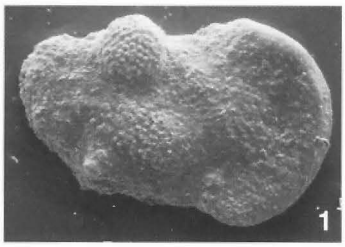
16. Hypotype, GSC 110094, Arkona Formation, right valve, carapace, x94, GSC DD2, 41.7 m.
17. Hypotype, GSC 110095, Arkona Formation, right valve, carapace, x94, GSC DD2, 41.7 m.

Figures 18-23. *Dirhabdus multicostatus* (Pauken), 1966.

18. Hypotype, GSC 110096, Bell Formation, left valve, carapace, x100, GSC DD1, 65.3 m.
19. Hypotype, GSC 110097, Bell Formation, right valve?, carapace, x99, GSC DD1, 67.4 m.
20. Hypotype, GSC 110098, Bell Formation, right valve?, carapace, x106, GSC DD1, 65.6 m.
21. Hypotype, GSC 110099, Bell Formation, right valve?, carapace, x87, GSC DD1, 65.3 m.
22. Hypotype, GSC 110100, Bell Formation, right valve?, carapace, x95, GSC DD1, 73.3 m.
23. Hypotype, GSC 110101, Bell Formation, left valve?, carapace, x85, GSC DD1, 73.3 m.

Figure 24. *Arcyzona homalosagenota* Kesling, 1952.

24. Hypotype, GSC 110102, Arkona Formation, left valve, carapace, x48, GSC DD2, 34.6 m.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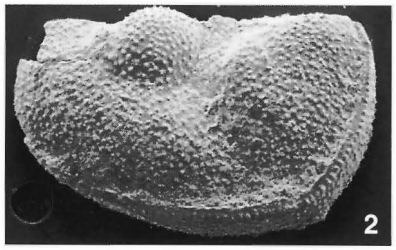
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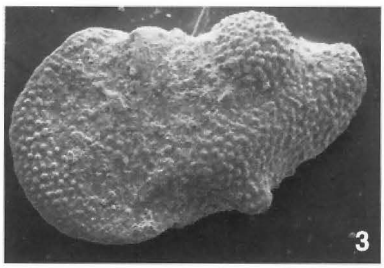
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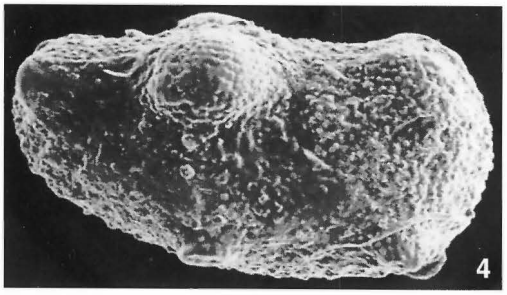
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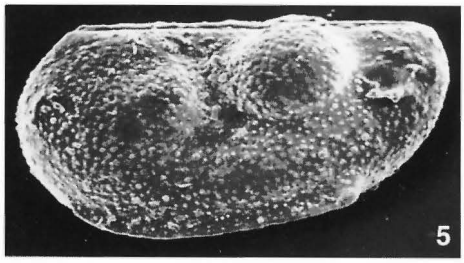
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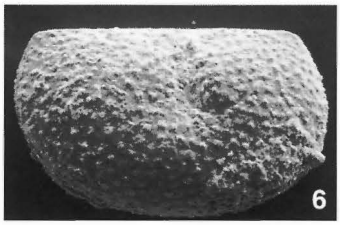
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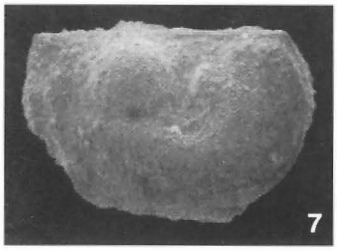
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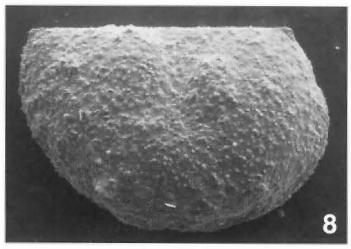
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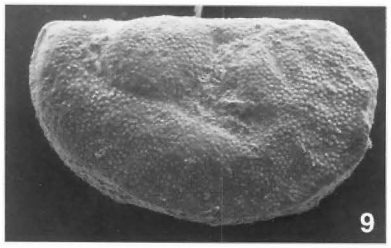
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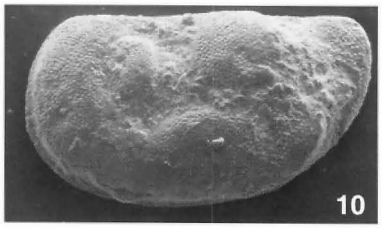
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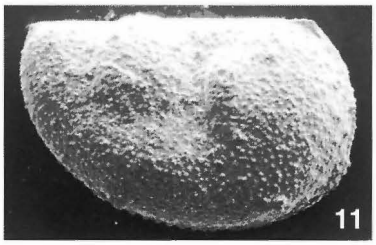
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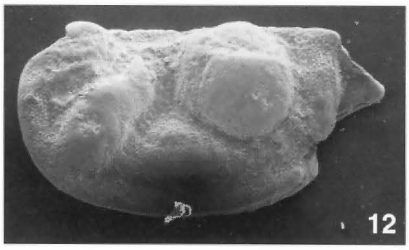
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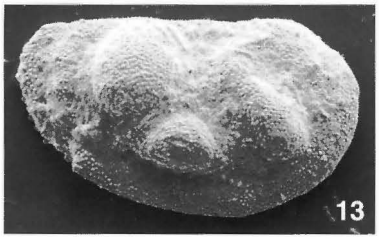
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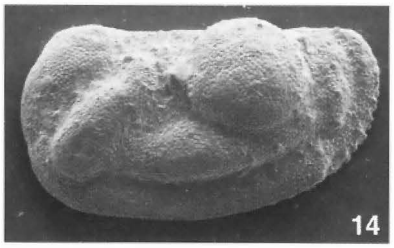
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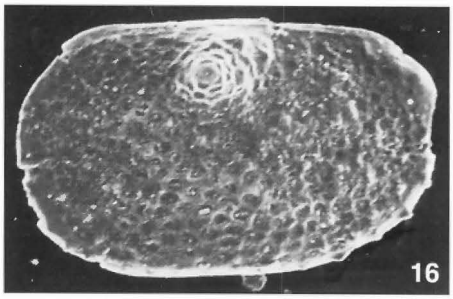
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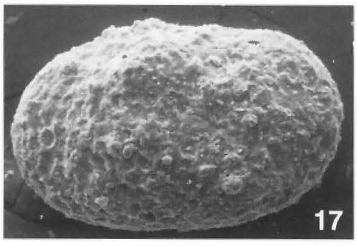
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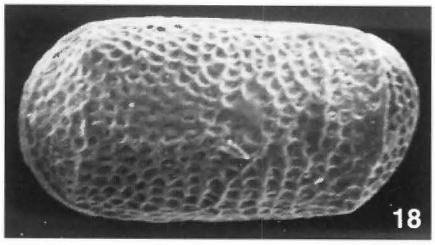
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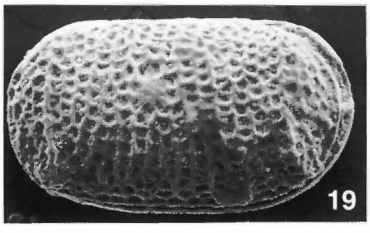
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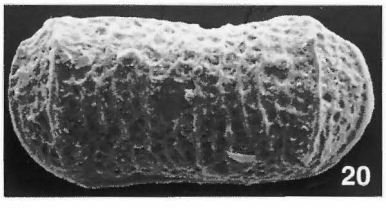
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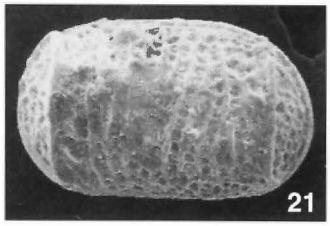
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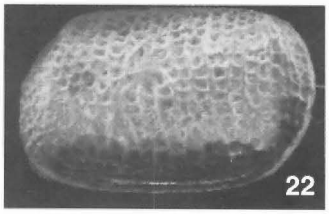
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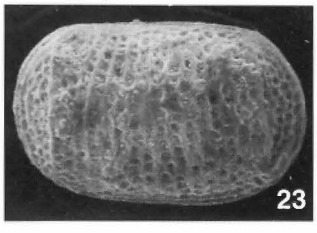
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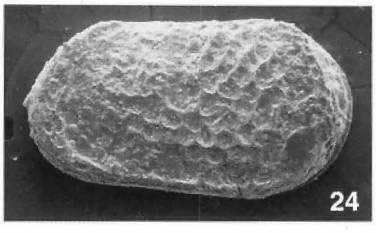
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PLATE 8

Figures 1-8. *Arcyzona homalosagenota* Kesling, 1952.

1. Hypotype, GSC 110103, Ipperwash Formation, right valve, carapace, x50, GSC DD2, 6.9 m.
2. Hypotype, GSC 110104, Arkona Formation, right valve, carapace, x55, GSC DD2, 34.6 m.
3. Hypotype, GSC 110105, Rockport Quarry Formation, left valve, carapace, x63, GSC DD2, 65.5 m.
4. Hypotype, GSC 110106, Widder Formation, left valve, carapace, x131, GSC DD2, 20.1 m.
5. Hypotype, GSC 110107, Ipperwash Formation, right valve, carapace, x44, GSC DD2, 6.9 m.
6. Hypotype, GSC 110108, Arkona Formation, left valve, carapace, x106, GSC DD1, 42.6 m.
7. Hypotype, GSC 110109, Bell Formation, right valve, carapace, x66, GSC DD1, 72.8 m.
8. Hypotype, GSC 110110, Ipperwash Formation, right valve, carapace, x67, GSC DD2, 7.2 m.

Figures 9-12. *Arcyzona* sp.

9. Figured specimen, GSC 110111, Widder Formation, right valve, carapace, x46, GSC DD2, 13.2 m.
10. Figured specimen, GSC 110112, Arkona Formation, right valve, carapace, x100, GSC DD1, 19.2 m.
11. Figured specimen, GSC 110113, Widder Formation, right valve, carapace, x47, GSC DD1, 6.9 m.
12. Figured specimen, GSC 110114, Arkona Formation, right valve, carapace, x45, GSC DD2, 33.7 m.

Figures 13, 14. *Scrobicula concentrica* (Stover), 1956.

13. Hypotype, GSC 110115, Widder Formation, right valve, carapace, x41, GSC DD2, 15.9 m.
14. Hypotype, GSC 110116, Hungry Hollow Formation, right valve, carapace, x112, GSC DD2, 30.4 m.

Figure 15. *Ehlersia hypercala* (Kesling and Kilgore), 1952.

15. Hypotype, GSC 110117, Widder Formation, right valve, carapace, x58, GSC DD2, 20.1 m.

Figures 16, 17. *Coelonella scapha* (Stewart), 1936.

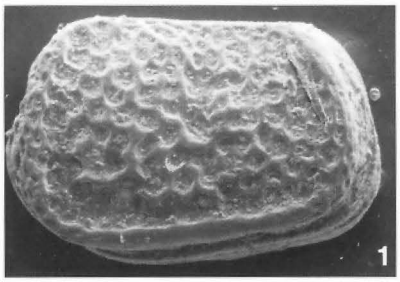
16. Hypotype, GSC 110118, Widder Formation, right valve, carapace, x66, GSC DD2, 17.7 m.
17. Hypotype, GSC 110119, Widder Formation, right valve, carapace, x53, GSC DD2, 22.2 m.

Figures 18-20. *Dizygopleura euglyphea* Warthin, 1934.

18. Hypotype, GSC 110120, Arkona Formation, left valve, carapace, x33, GSC DD2, 49.3 m.
19. Hypotype, GSC 110121, Arkona Formation, right valve, carapace, x39, GSC DD2, 50.1 m.
20. Hypotype, GSC 110122, Arkona Formation, right valve, carapace, x40, GSC DD2, 47.0 m.

Figures 21-23. *Dizygopleura trisinuata* Van Pelt, 1933.

21. Hypotype, GSC 110123, Rockport Quarry Formation, left valve, carapace, x41, GSC DD2, 68.3 m.
22. Hypotype, GSC 110124, Arkona Formation, right valve, carapace, x47, GSC DD1, 42.6 m.
23. Hypotype, GSC 110125, Arkona Formation, left valve, carapace, x55, GSC DD2, 37.6 m.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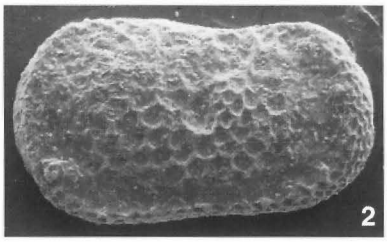
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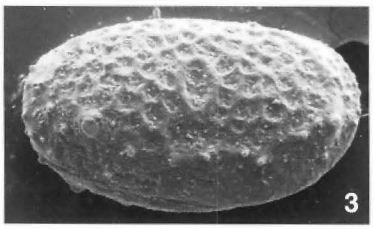
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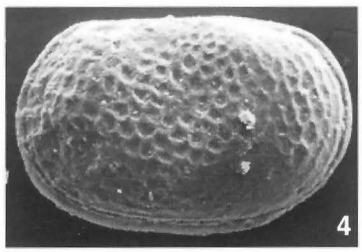
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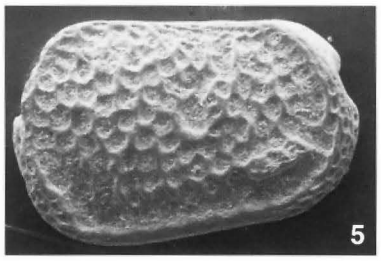
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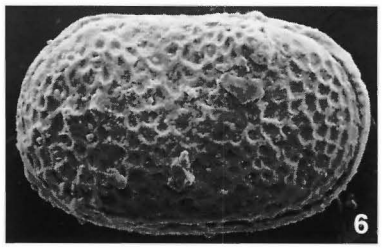
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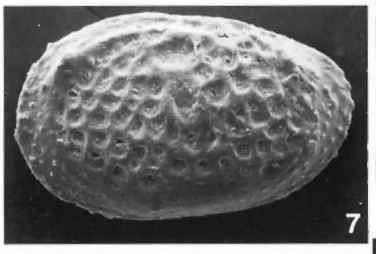
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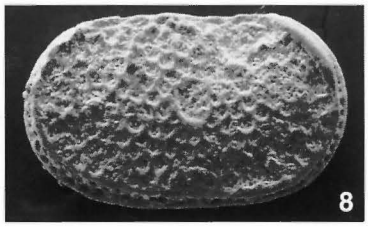
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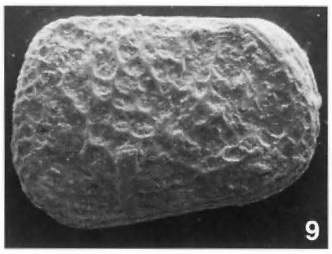
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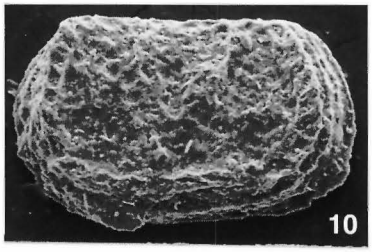
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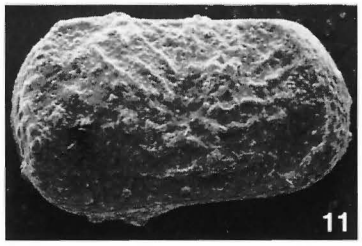
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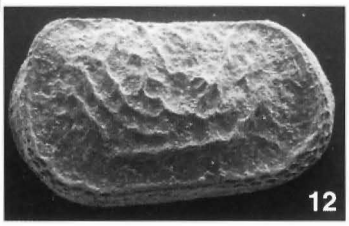
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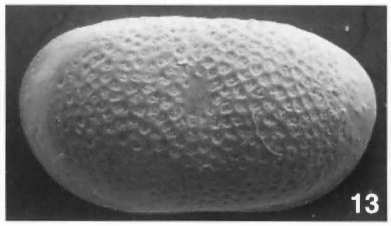
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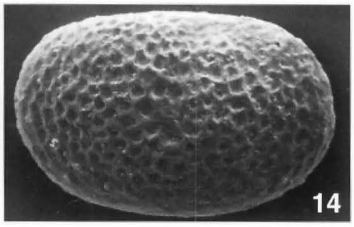
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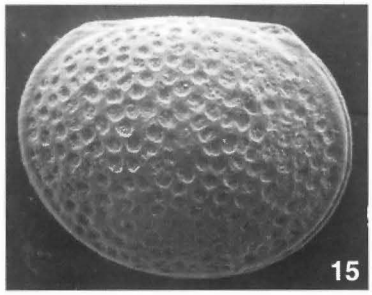
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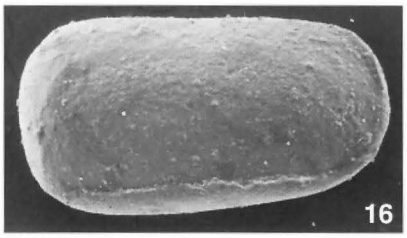
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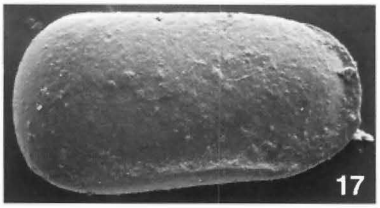
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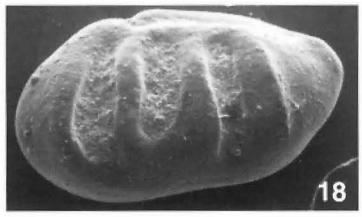
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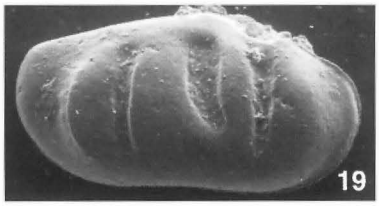
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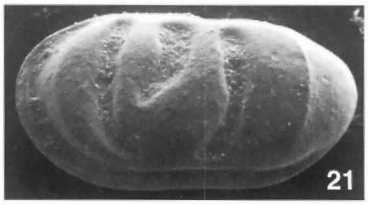
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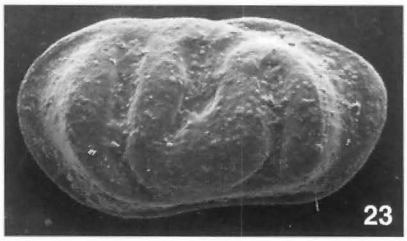
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PLATE 9

Figures 1-6. *Dizygopleura trisinuata* Van Pelt, 1933.

1. Hypotype, GSC 110126, Arkona Formation, right valve, carapace, x50, GSC DD1, 33.4 m.
2. Hypotype, GSC 110127, Arkona Formation, right valve, carapace, x46, GSC DD1, 50.1 m.
3. Hypotype, GSC 110128, Arkona Formation, left valve, carapace, x61, GSC DD1, 50.1 m.
4. Hypotype, GSC 110129, Bell Formation, left valve, carapace, x90, GSC DD1, 64.1 m.
5. Hypotype, GSC 110130, Arkona Formation, left valve, carapace, x49, GSC DD1, 38.8 m.
6. Hypotype, GSC 110131, Rockport Quarry Formation, right valve, carapace, x49, GSC DD1, 63.5 m.

Figures 7-15. *Poloniella cingulata* Warthin, 1934.

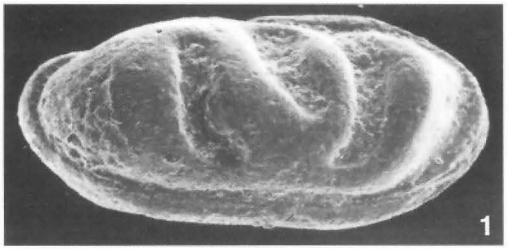
7. Hypotype, GSC 110132, Arkona Formation, left valve, carapace, heteromorph, x40, GSC DD1, 33.7 m.
8. Hypotype, GSC 110133, Arkona Formation, left valve, carapace, x60, GSC DD1, 50.1 m.
9. Hypotype, GSC 110134, Arkona Formation, left valve, carapace, x50, GSC DD1, 49.8 m.
10. Hypotype, GSC 110135, Arkona Formation, left valve, carapace, heteromorph, x30, GSC DD1, 48.3 m.
11. Hypotype, GSC 110136, Arkona Formation, right valve, carapace, x70, GSC DD1, 46.8 m.
12. Hypotype, GSC 110137, Arkona Formation, right valve, carapace, x58, GSC DD1, 49.2 m.
13. Hypotype, GSC 110138, Arkona Formation, right valve, carapace, heteromorph, x45, GSC DD1, 38.5 m.
14. Hypotype, GSC 110139, Arkona Formation, left valve, carapace, x56, GSC DD1, 38.5 m.
15. Hypotype, GSC 110140, Arkona Formation, right valve, carapace, x45, GSC DD1, 44.4 m.

Figures 16-19. *Poloniella* sp.?

16. Figured specimen, GSC 110141, Arkona Formation, right valve, carapace, x61, GSC DD2, 58.9 m.
17. Figured specimen, GSC 110142, Bell Formation, right valve, carapace, x34, GSC DD2, 73.7 m.
18. Figured specimen, GSC 110143, Bell Formation, left valve, carapace, x50, GSC DD2, 81.2 m.
19. Figured specimen, GSC 110144, Arkona Formation, right valve, carapace, x37, GSC DD1, 31.9 m.

Figures 20-23. *Eukloedenella doverensis* Turner, 1939.

20. Hypotype, GSC 110145, Rockport Quarry Formation, right valve, carapace, x91, GSC DD1, 63.8 m.
21. Hypotype, GSC 110146, Arkona Formation, left valve, carapace, x39, GSC DD2, 33.7 m.
22. Hypotype, GSC 110147, Ipperwash Formation, right valve, carapace, x43, GSC DD2, 4.5 m.
23. Hypotype, GSC 110148, Arkona Formation, right valve, carapace, x50, GSC DD2, 36.1 m.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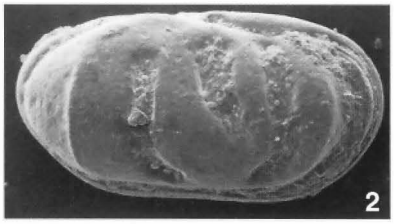
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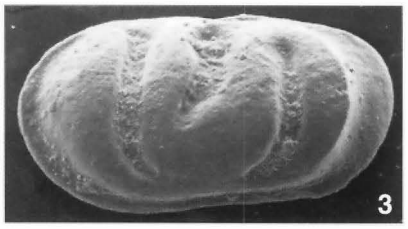
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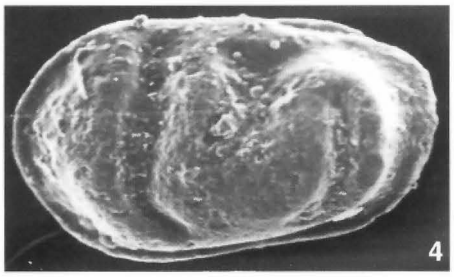
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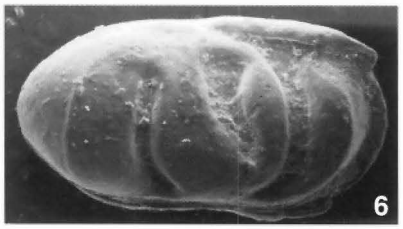
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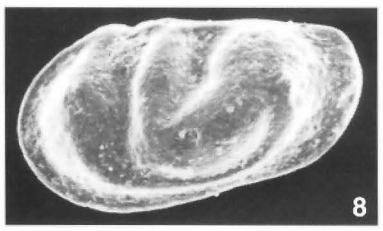
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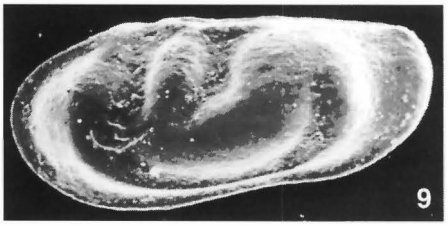
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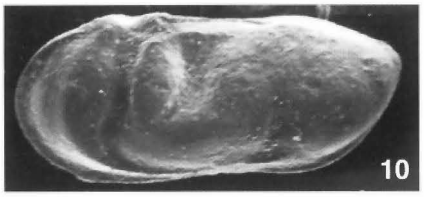
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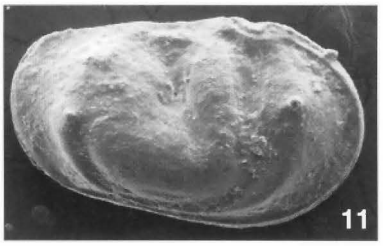
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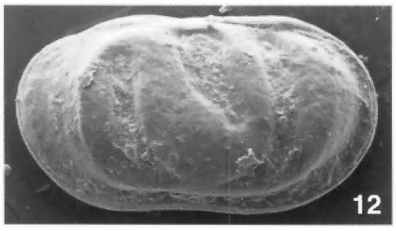
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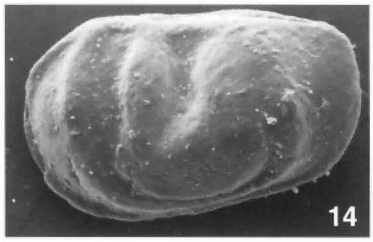
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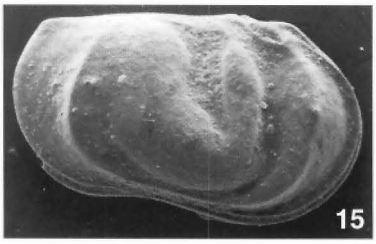
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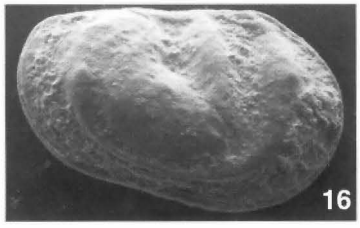
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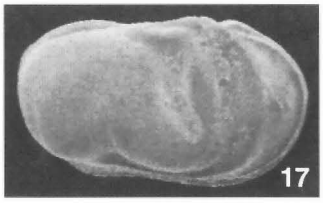
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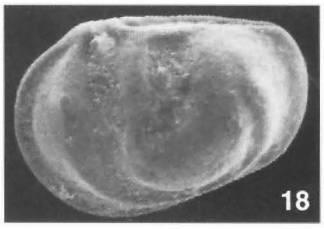
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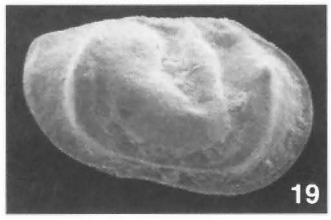
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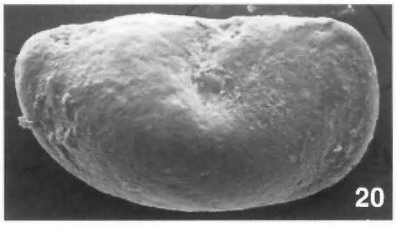
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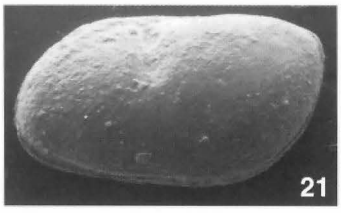
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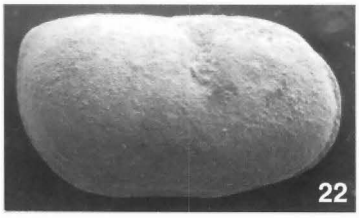
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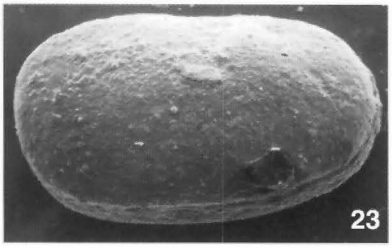
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PLATE 10

Figures 1-3. *Eukloedenella doverensis* Turner, 1939.

1. Hypotype, GSC 110149, Arkona Formation, left valve, carapace, x50, GSC DD1, 47.4 m.
2. Hypotype, GSC 110150, Hungry Hollow Formation, right valve, carapace, x42, GSC DD2, 30.4 m.
3. Hypotype, GSC 110151, Arkona Formation, right valve, carapace, x44, GSC DD1, 19.2 m.

Figures 4-9. *Punctoprimitia simplex* (Stewart) 1936.

4. Hypotype, GSC 110152, Arkona Formation, left valve, carapace, x78, GSC DD1, 43.5 m.
5. Hypotype, GSC 110153, Arkona Formation, right valve, carapace, x80, GSC DD1, 34 m.
6. Hypotype, GSC 110154, Bell Formation, left valve, carapace, x80, GSC DD2, 81.2 m.
7. Hypotype, GSC 110155, Bell Formation, right valve, carapace, x78, GSC DD1, 72.8 m.
8. Hypotype, GSC 110156, Bell Formation, right valve, carapace, x80, GSC DD1, 72.8 m.
9. Hypotype, GSC 110157, Arkona Formation, right valve, carapace, x90, GSC DD1, 32.8 m.

Figures 9-15. *Punctoprimitia punctata* (Turner), 1939.

10. Hypotype, GSC 110158, Widder Formation, left valve, carapace, x81, GSC DD2, 20.4 m.
11. Hypotype, GSC 110159, Widder Formation, right valve, carapace, x81, GSC DD2, 23.4 m.
12. Hypotype, GSC 110160, Widder Formation, right valve, carapace, x78, GSC DD2, 20.4 m.
13. Hypotype, GSC 110161, Widder Formation, left valve, carapace, x81, GSC DD2, 23.4 m.
14. Hypotype, GSC 110162, Widder Formation, right valve, carapace, x75, GSC DD2, 20.1 m.
15. Hypotype, GSC 110163, Widder Formation, left valve, carapace, x74, GSC DD1, 9.9 m.

Figure 16. *Hypotetragona fractodorsalis* Kesling and Chilman, 1978.

16. Hypotype, GSC 110164, Arkona Formation, right valve, carapace, x69, GSC DD1, 34 m.

Figures 17-21. *Hypotetragona harrietensis* (Coryell and Malkin), 1936.

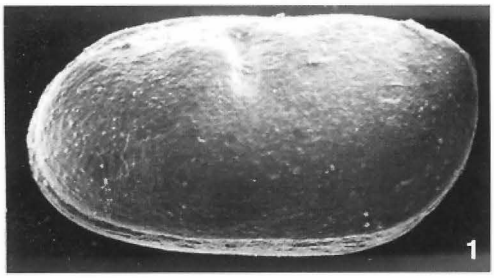
17. Hypotype, GSC 110165, Arkona Formation, right valve, carapace, x66, GSC DD1, 49.8 m.
18. Hypotype, GSC 110166, Arkona Formation, right valve, carapace, x60, GSC DD2, 58.9 m.
19. Hypotype, GSC 110167, Bell Formation, right valve, carapace, x53, GSC DD2, 75.2 m.
20. Hypotype, GSC 110168, Bell Formation, right valve, carapace, x47, GSC DD2, 75.2 m.
21. Hypotype, GSC 110169, Bell Formation, right valve, carapace, x62, GSC DD2, 81.2 m.

Figures 22-26. *Cryptophyllus arsinius* Stover, 1956.

22. Hypotype, GSC 110170, Bell Formation, left valve, carapace, x76, GSC DD2, 76.1 m.
23. Hypotype, GSC 110171, Bell Formation, right valve, carapace, x64, GSC DD2, 76.1 m.
24. Hypotype, GSC 110172, Rockport Quarry Formation, right valve, carapace, x63, GSC DD2, 65.9 m.
25. Hypotype, GSC 110173, Bell Formation, left valve, carapace, x65, GSC DD2, 81.2 m.
26. Hypotype, GSC 110174, Bell Formation, left valve, carapace, x66, GSC DD2, 81.2 m.

Figure 27. *Cryptophyllus minusculus*? Kesling and Chilman, 1978.

27. Hypotype, GSC 110175, Bell Formation, right valve, carapace, x72, GSC DD2, 76.1 m.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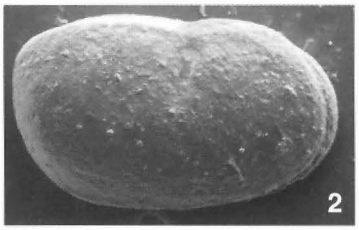
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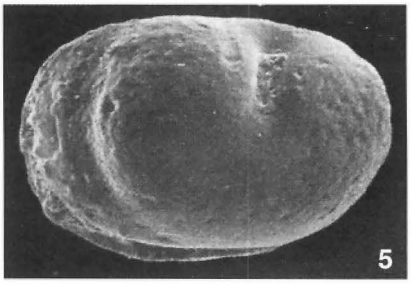
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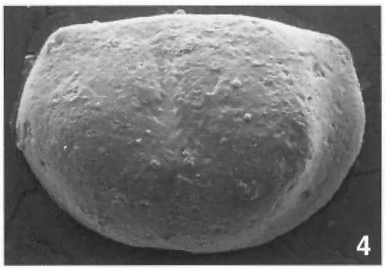
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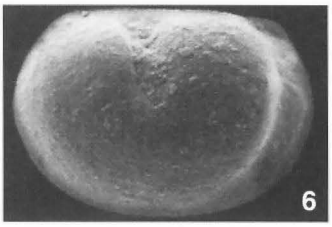
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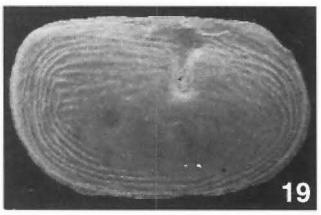
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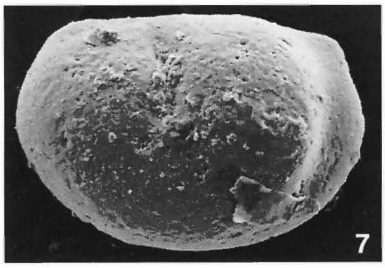
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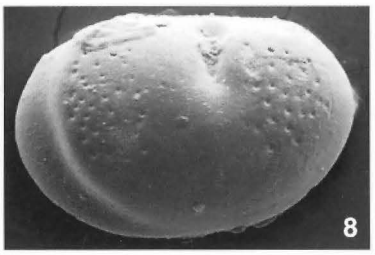
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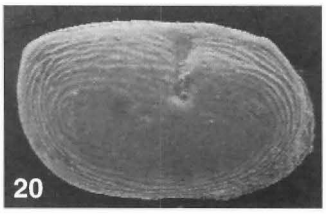
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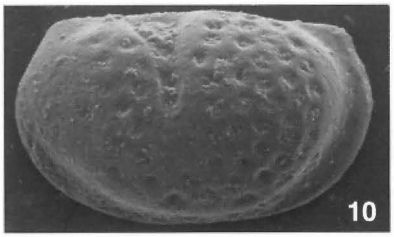
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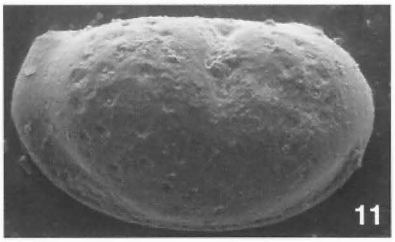
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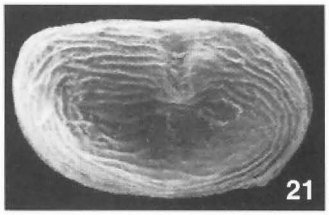
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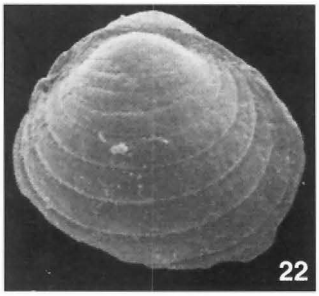
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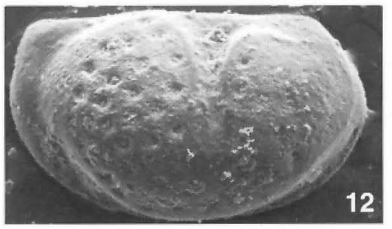
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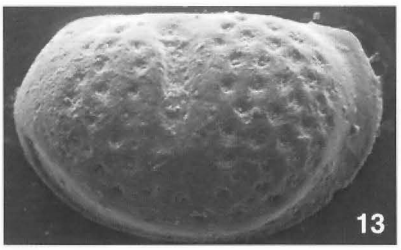
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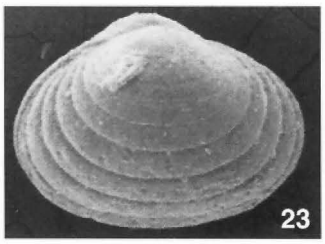
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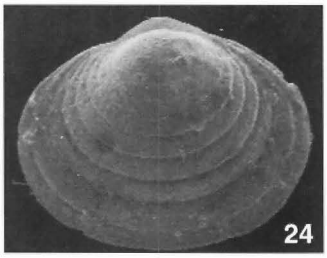
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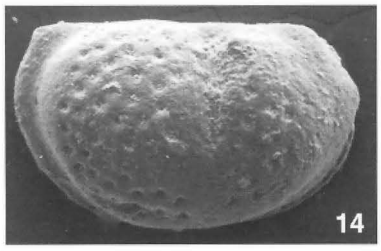
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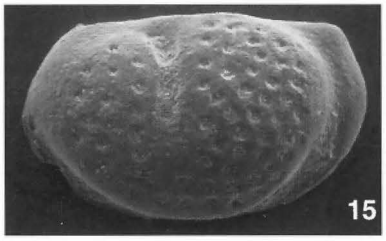
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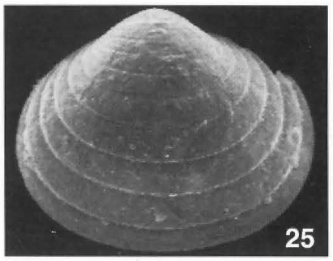
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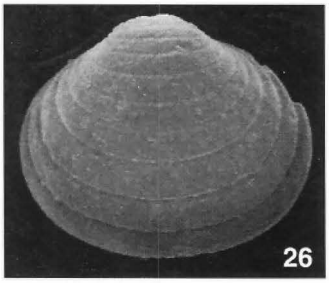
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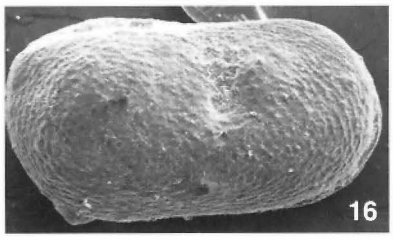
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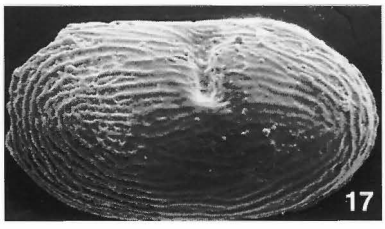
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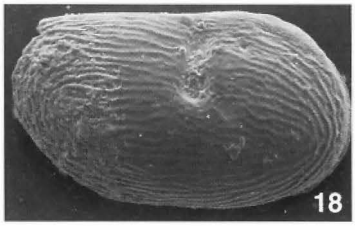
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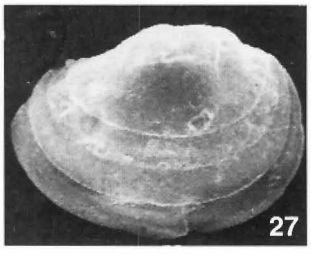
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PLATE 11

Figures 1, 2. *Cryptophyllus* sp.

1. Figured specimen, GSC 110176, Bell Formation, right valve, carapace, x75, GSC DD2, 76.1 m.
2. Figured specimen, GSC 110177, Bell Formation, left valve, carapace, x90, GSC DD2, 81.2 m.

Figure 3. *Rectobairdia emaciata* (Kesling and Kilgore), 1952.

3. Hypotype, GSC 110178, Widder Formation, left valve, carapace, x55, GSC DD2, 27.7 m.

Figure 4. *Acratia simplex* Kesling and Chilman, 1978.

4. Hypotype, GSC 110179, Arkona Formation, right valve, carapace, x58, GSC DD1, 51 m.

Figures 5, 6. *Pronipantex planus* Kesling and Chilman, 1978.

5. Hypotype, GSC 110180, Widder Formation, ventral view, carapace, x53, GSC DD2, 19.8 m.
6. Hypotype, GSC 110181, Arkona Formation, right valve, carapace, x54, GSC DD2, 58.9 m.

Figures 7-9. *Wideneria lipsa* Kesling and Chilman, 1978.

7. Hypotype, GSC 110182, Arkona Formation, right valve, carapace, x70, GSC DD2, 58.3 m.
8. Hypotype, GSC 110183, Arkona Formation, left valve, carapace, x45, GSC DD2, 58.6 m.
9. Hypotype, GSC 110184, Arkona Formation, right valve?, carapace, x54, GSC DD2, 58.6 m.

Figure 10. *Wideneria*? sp.

10. Figured specimen, GSC 110185, Arkona Formation, right valve, carapace, x45, GSC DD2, 58.6 m.

Figure 11. *Monoceratina casei* Warthin, 1934.

11. Hypotype, GSC 110186, Rockport Quarry Formation, right valve, carapace, x90, GSC DD2, 67.2 m.

Figures 12-23. *Ponderodictya punctulifera* (Hall), 1860.

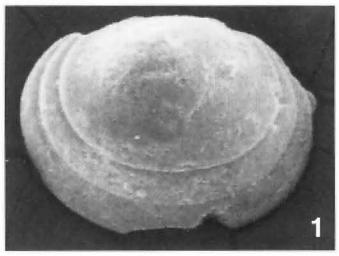
12. Hypotype, GSC 110187, Arkona Formation, right valve, carapace, x25, GSC DD1, 33.4 m.
13. Hypotype, GSC 110188, Arkona Formation, right valve, carapace, x31, GSC DD1, 42.6 m.
14. Hypotype, GSC 110189, Arkona Formation, right valve, carapace, x29, GSC DD2, 57.4 m.
15. Hypotype, GSC 110190, Widder Formation, right valve, carapace, x32, GSC DD2, 22.5 m.
16. Hypotype, GSC 110191, Ipperwash Formation, right valve, carapace, x35, GSC DD2, 6.9 m.
17. Hypotype, GSC 110192, Ipperwash Formation, right valve, carapace, x36, GSC DD2, 7.2 m.
18. Hypotype, GSC 110193, Bell Formation, right valve, carapace, x29, GSC DD2, 84.5 m.
19. Hypotype, GSC 110194, Bell Formation, right valve, carapace, x28, GSC DD2, 84.5 m.
20. Hypotype, GSC 110195, Bell Formation, right valve, carapace, x28, GSC DD2, 84.5 m.
21. Hypotype, GSC 110196, Bell Formation, left valve, carapace, x28, GSC DD2, 76.1 m.
22. Hypotype, GSC 110197, Bell Formation, right valve, carapace, x29, GSC DD2, 76.1 m.
23. Hypotype, GSC 110198, Rockport Quarry Formation, right valve, carapace, x31, GSC DD1, 62.7 m.

Figures 24, 25. *Ponderodictya ohioensis* (Stewart), 1936.

24. Hypotype, GSC 110199, Widder Formation, left valve, carapace, x37, GSC DD2, 15 m.
25. Hypotype, GSC 110200, Arkona Formation, right valve, carapace, x36, GSC DD1, 55 m.

Figures 26, 27. *Ponderodictya rhodesi* Kesling and Chilman, 1978.

26. Hypotype, GSC 110201, Arkona Formation, right valve, carapace, x64, GSC DD2, 58.9 m.
27. Hypotype, GSC 110202, Widder Formation, left valve, carapace, x58, GSC DD2, 20.7 m.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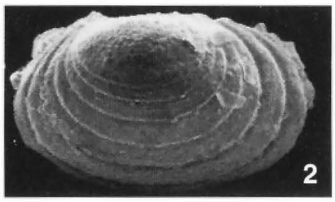
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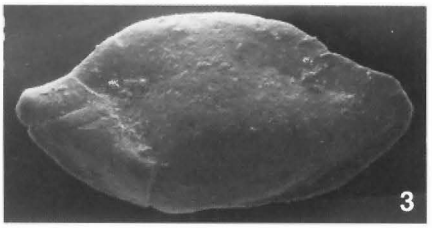
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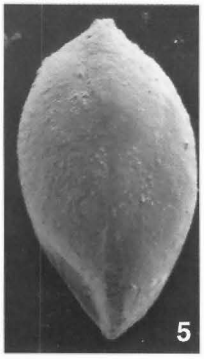
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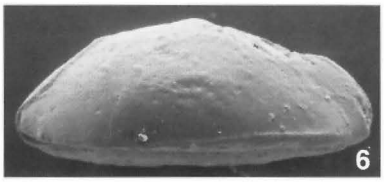
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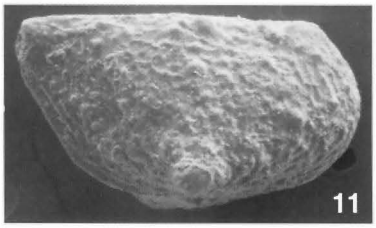
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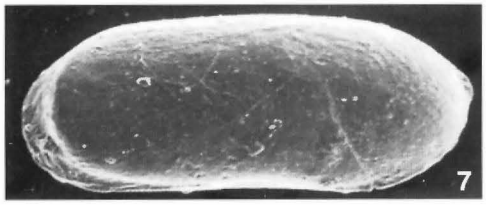
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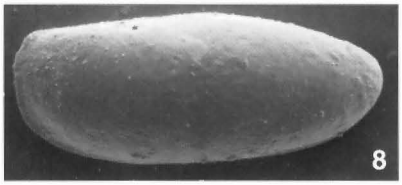
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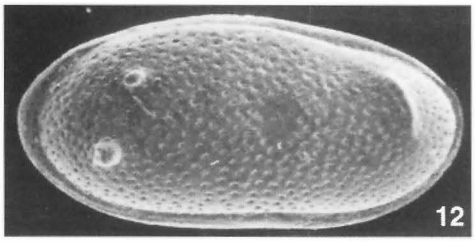
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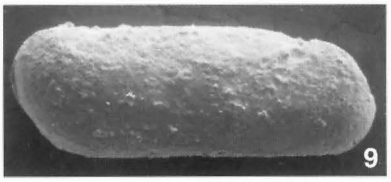
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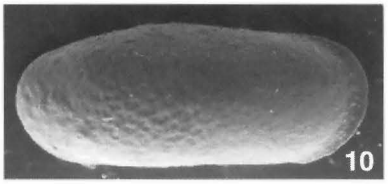
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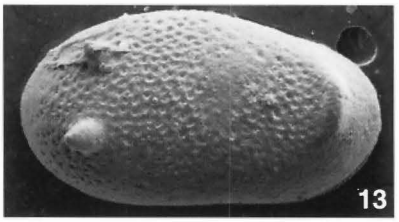
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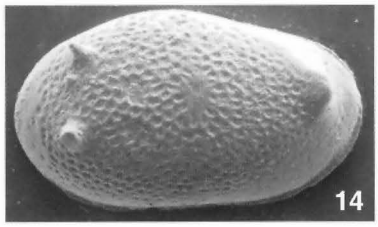
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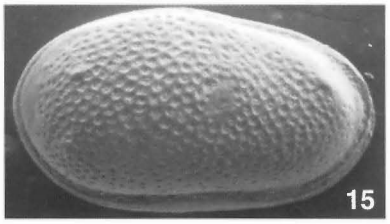
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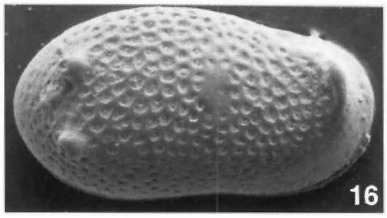
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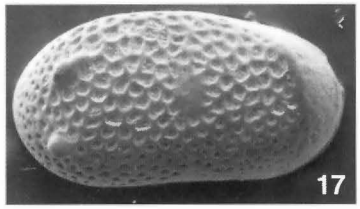
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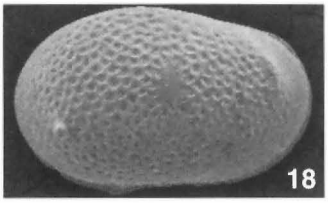
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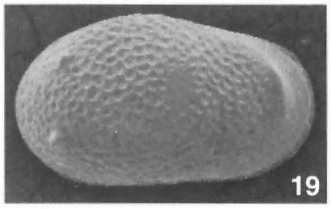
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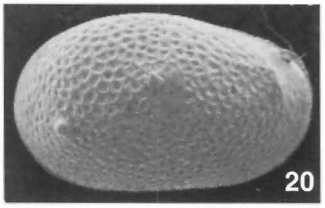
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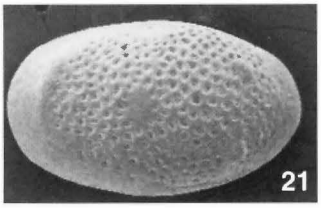
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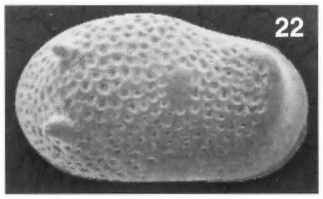
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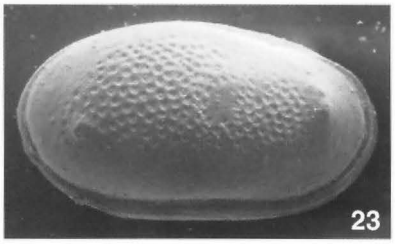
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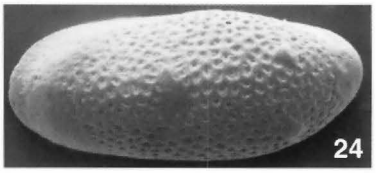
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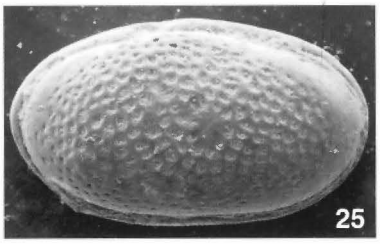
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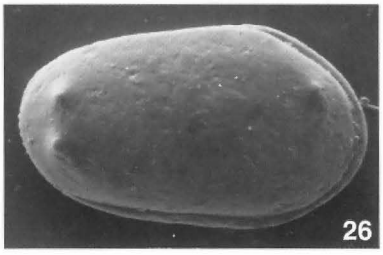
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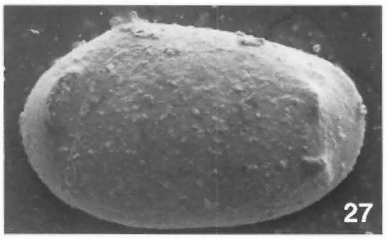
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PLATE 12

Figures 1-3. *Ponderodictya rhodesi* Kesling and Chilman, 1978.

1. Hypotype, GSC 110203, Widder Formation, right valve, carapace, x58, GSC DD2, 17.7 m.
2. Hypotype, GSC 110204, Rockport Quarry Formation, right valve, carapace, x49, GSC DD2, 68.0 m.
3. Hypotype, GSC 110205, Widder Formation, left valve, carapace, x69, GSC DD2, 14.7 m.

Figures 4, 5. *Ponderodictya* sp.

4. Figured specimen, GSC 110206, Widder Formation, right valve, carapace, x91, GSC DD1, 8.4 m.
5. Figured specimen, GSC 110207, Arkona Formation, right valve, carapace, x34, GSC DD1, 38.2 m.

Figure 6. *Bairdiocypris transptyxis* (Stover) 1956.

6. Hypotype, GSC 110208, Arkona Formation, left valve, carapace, x60, GSC DD1, 42.6 m.

Figures 7-10. *Praepilatina silicensis* Kesling and Chilman, 1978.

7. Hypotype, GSC 110209, Arkona Formation, right valve, carapace, x70, GSC DD1, 33.7 m.
8. Hypotype, GSC 110210, Arkona Formation, right valve, carapace, x60, GSC DD1, 33.7 m.
9. Hypotype, GSC 110211, Widder Formation, right valve, carapace, x76, GSC DD2, 14.7 m.
10. Hypotype, GSC 110212, Arkona Formation, right valve, carapace, x50, GSC DD1, 47.7 m.

Figures 11-14. *Cytherellina lucasensis* (Stewart), 1936.

11. Hypotype, GSC 110213, Rockport Quarry Formation, right valve, carapace, x66, GSC DD1, 62.1 m.
12. Hypotype, GSC 110214, Bell Formation, right valve, carapace, x52, GSC DD1, 74.3 m.
13. Hypotype, GSC 110215, Arkona Formation, right valve, carapace, x68, GSC DD2, 31.3 m.
14. Hypotype, GSC 110216, Arkona Formation, right valve, carapace, x46, GSC DD2, 57.4 m.

Figures 15, 16. *Cytherellina subquadrata* (Stewart), 1936.

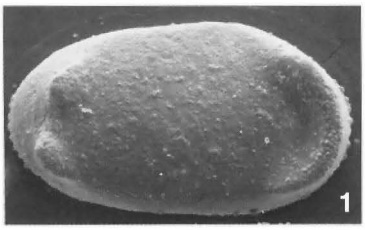
15. Hypotype, GSC 110217, Widder Formation, right valve, carapace, x65, GSC DD2, 15 m.
16. Hypotype, GSC 110218, Arkona Formation, left valve, carapace, x54, GSC DD1, 46.8 m.

Figures 17-21. *Cytherellina* sp.?

17. Figured specimen, GSC 110219, Arkona Formation, right valve, carapace, x40, GSC DD1, 48.3 m.
18. Figured specimen, GSC 110220, Arkona Formation, right valve, carapace, x57, GSC DD1, 46.8 m.
19. Figured specimen, GSC 110221, Bell Formation, right valve, carapace, x46, GSC DD1, 76 m.
20. Figured specimen, GSC 110222, Arkona Formation, right valve, carapace, x49, GSC DD2, 58.9 m.
21. Figured specimen, GSC 110223, Arkona Formation, right valve, carapace, x58, GSC DD1, 51.6 m.

Figure 22. *Menoeidina subreniformis* Stewart, 1936.

22. Hypotype, GSC 110224, Arkona Formation, left valve, carapace, x68, GSC DD1, 43.5 m.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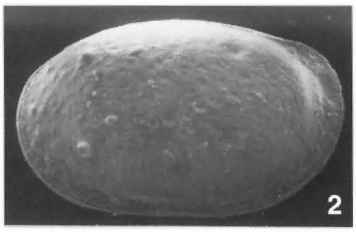
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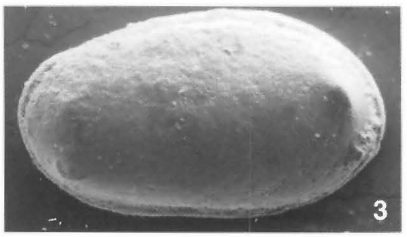
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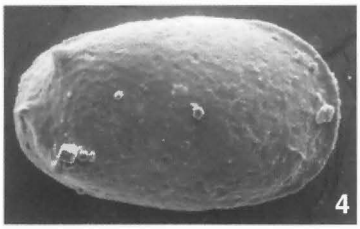
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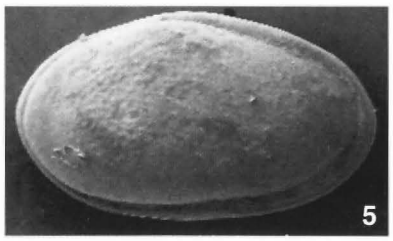
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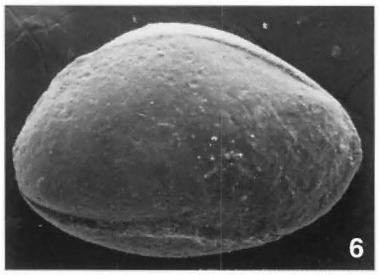
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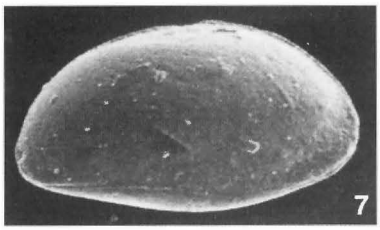
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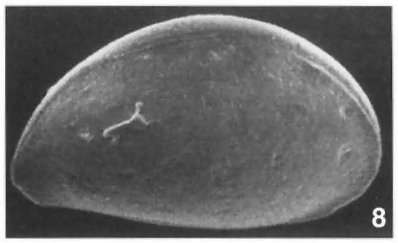
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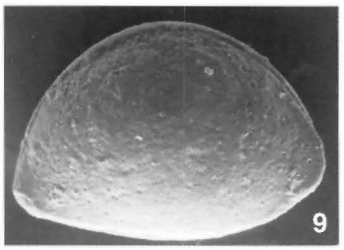
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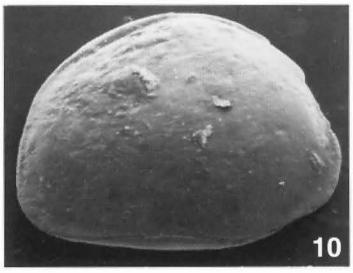
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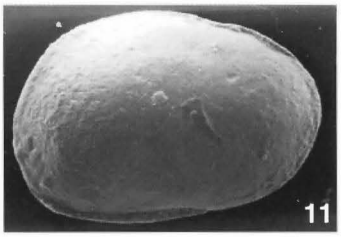
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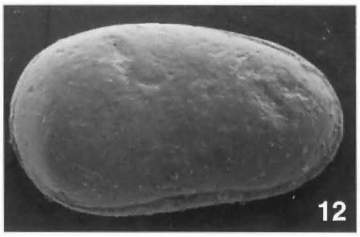
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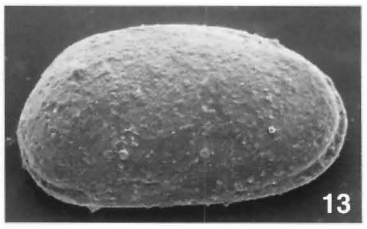
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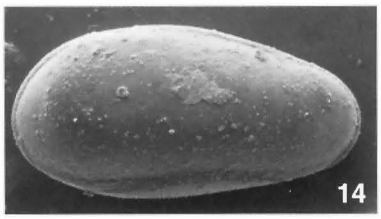
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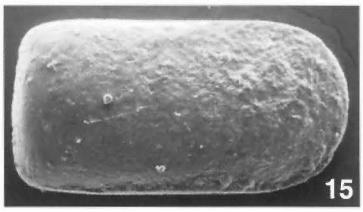
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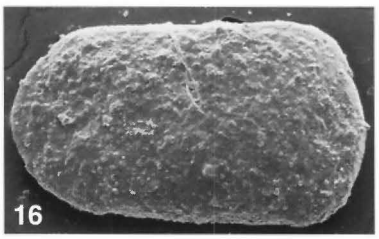
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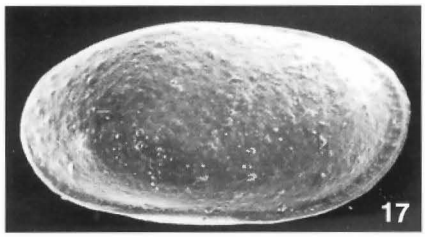
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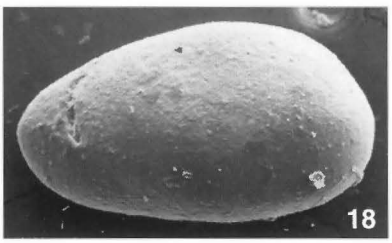
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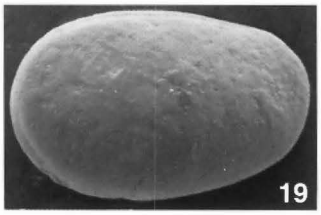
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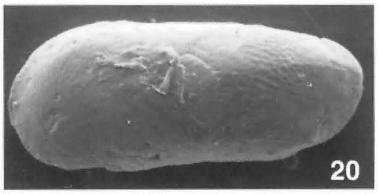
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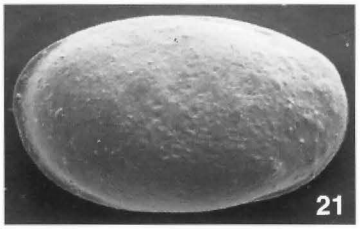
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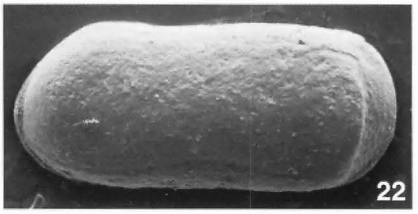
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PLATE 13

Figures 1, 2. *Menoeidina subreniformis* Stewart, 1936.

1. Hypotype, GSC 110225, Arkona Formation, left valve, carapace, x68, GSC DD1, 43.5 m.
2. Hypotype, GSC 110226, Bell Formation, right valve, carapace, x62, GSC DD1, 76 m.

Figures 3-9. *Menoeidina arcuata* Turner, 1939.

3. Hypotype, GSC 110227, Arkona Formation, right valve, carapace, x70, GSC DD1, 41.7 m.
4. Hypotype, GSC 110228, Rockport Quarry Formation, right valve, carapace, x70, GSC DD1, 60.3 m.
5. Hypotype, GSC 110229, Arkona Formation, right valve, carapace, x70, GSC DD1, 42.3 m.
6. Hypotype, GSC 110230, Rockport Quarry Formation, right valve, carapace, x80, GSC DD1, 62.7 m.
7. Hypotype, GSC 110231, Arkona Formation, left valve, carapace, x75, GSC DD2, 49.8 m.
8. Hypotype, GSC 110232, Arkona Formation, right valve, carapace, x83, GSC DD1, 51 m.
9. Hypotype, GSC 110233, Widder Formation, left valve, carapace, x90, GSC DD2, 22.2 m.

Figures 10-15. *Menoeidina paucipunctata* Kesling and Chilman, 1978.

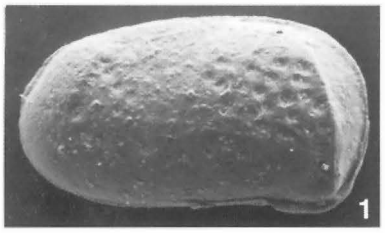
10. Hypotype, GSC 110234, Bell Formation, right valve, carapace, x70, GSC DD1, 75.2 m.
11. Hypotype, GSC 110235, Arkona Formation, left valve, carapace, x90, GSC DD1, 48.3 m.
12. Hypotype, GSC 110236, Arkona Formation, left valve, carapace, x80, GSC DD1, 51.6 m.
13. Hypotype, GSC 110237, Arkona Formation, right valve, carapace, x84, GSC DD1, 50.4 m.
14. Hypotype, GSC 110238, Bell Formation, left valve, carapace, x69, GSC DD1, 76.1 m.
15. Hypotype, GSC 110239, Bell Formation, left valve, carapace, x74, GSC DD1, 69.2 m.

Figures 16-19. *Menoeidina scopeli* Coley, 1954.

16. Hypotype, GSC 110240, Widder Formation, right valve, carapace, x86, GSC DD2, 16.8 m.
17. Hypotype, GSC 110241, Widder Formation, right valve, carapace, x81, GSC DD2, 20.1 m.
18. Hypotype, GSC 110242, Widder Formation, right valve, carapace, x78, GSC DD2, 19.8 m.
19. Hypotype, GSC 110243, Widder Formation, right valve, carapace, x81, GSC DD2, 22.5 m.

Figures 20, 21. *Quasillites concentricus* (Turner), 1939.

20. Hypotype, GSC 110244, Bell Formation, left valve, carapace, x60, GSC DD2, 73.7 m.
21. Hypotype, GSC 110245, Arkona Formation, right valve, carapace, x67, GSC DD2, 58.9 m.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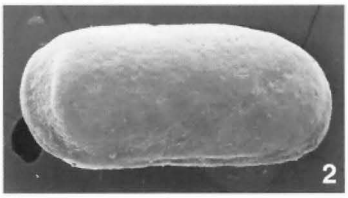
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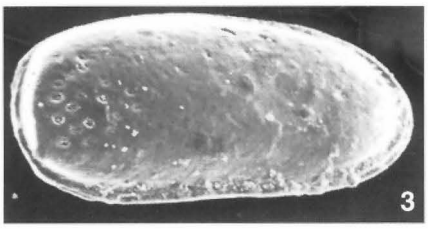
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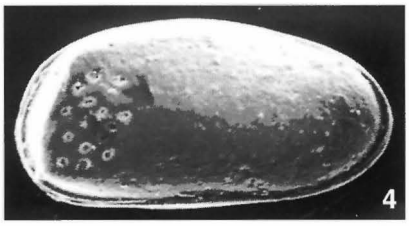
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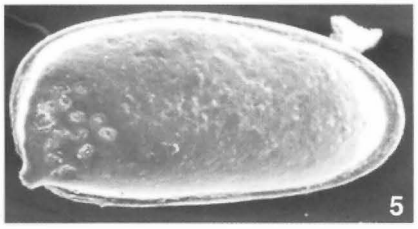
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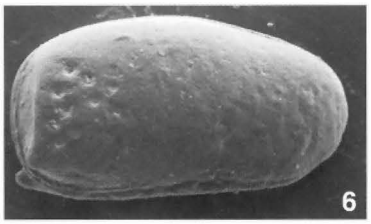
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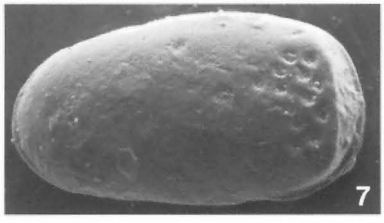
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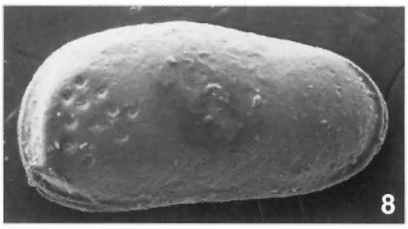
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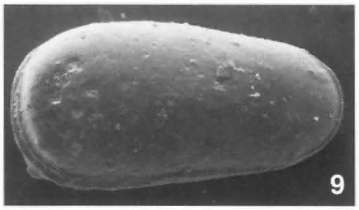
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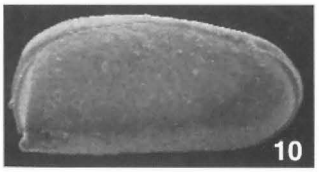
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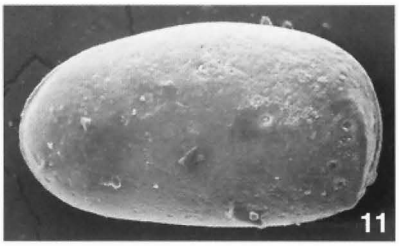
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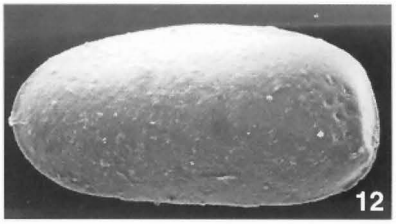
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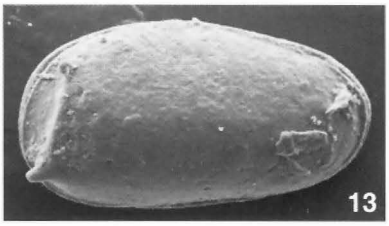
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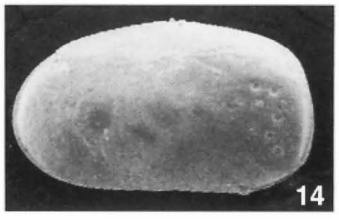
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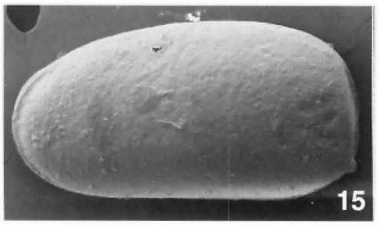
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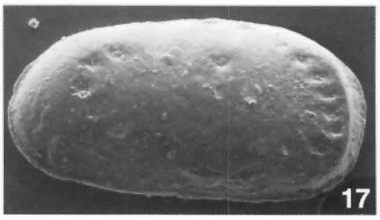
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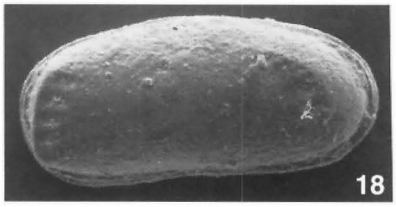
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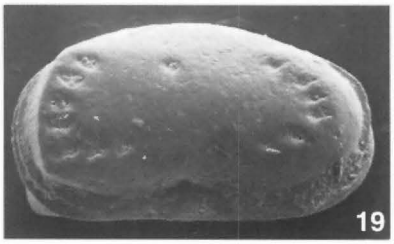
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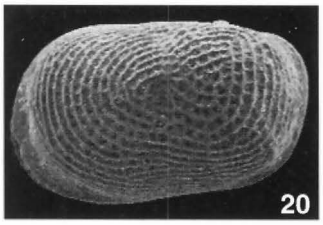
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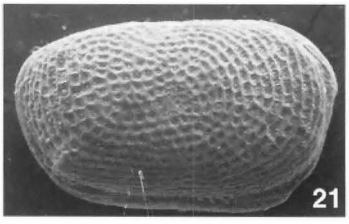
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PLATE 14

Figures 1-9. *Quasillites concentricus* (Turner), 1939.

1. Hypotype, GSC 110246, Bell Formation, left valve, carapace, x67, GSC DD1, 66.8 m.
2. Hypotype, GSC 110247, Arkona Formation, right valve, carapace, x84, GSC DD1, 51.6 m.
3. Hypotype, GSC 110248, Arkona Formation, right valve, carapace, x62, GSC DD1, 55.6 m.
4. Hypotype, GSC 110249, Rockport Quarry Formation, left valve, carapace, x72, GSC DD1, 62.7 m.
5. Hypotype, GSC 110250, Arkona Formation, left valve, carapace, x60, GSC DD1, 41.7 m.
6. Hypotype, GSC 110251, Arkona Formation, left valve, carapace, x70, GSC DD1, 47.1 m.
7. Hypotype, GSC 110252, Arkona Formation, left valve, carapace, x70, GSC DD1, 42.3 m.
8. Hypotype, GSC 110253, Arkona Formation, right valve, carapace, x63, GSC DD1, 40 m.
9. Hypotype, GSC 110254, Arkona Formation, right valve, carapace, x66, GSC DD1, 40.3 m.

Figures 10-18. *Quasillites fordei* Coryell and Malkin, 1936.

10. Hypotype, GSC 110255, Arkona Formation, left valve, carapace, x49, GSC DD1, 51.6 m.
11. Hypotype, GSC 110256, Rockport Quarry Formation, left valve, carapace, x51, GSC DD2, 68.0 m.
12. Hypotype, GSC 110257, Arkona Formation, right valve, carapace, x85, GSC DD1, 51.6 m.
13. Hypotype, GSC 110258, Widder Formation, right valve, carapace, x51, GSC DD2, 22.2 m.
14. Hypotype, GSC 110259, Hungry Hollow Formation, right valve, carapace, x66, GSC DD2, 29.8 m.
15. Hypotype, GSC 110260, Arkona Formation, left valve, carapace, x49, GSC DD2, 57.7 m.
16. Hypotype, GSC 110261, Arkona Formation, right valve, carapace, x49, GSC DD2, 57.4 m.
17. Hypotype, GSC 110262, Arkona Formation, left valve, carapace, x47, GSC DD1, 18.6 m.
18. Hypotype, GSC 110263, Arkona Formation, right valve, carapace, x53, GSC DD2, 47.1 m.

Figures 19-23. *Quasillites sublunatus* (Stewart), 1936.

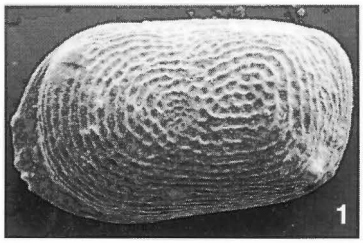
19. Hypotype, GSC 110264, Ipperwash Formation, left valve, carapace, x48, GSC DD2, 9.3 m.
20. Hypotype, GSC 110265, Arkona Formation, left valve, carapace, x65, GSC DD2, 35.2 m.
21. Hypotype, GSC 110266, Arkona Formation, right valve, carapace, x50, GSC DD1, 42.6 m.
22. Hypotype, GSC 110267, Arkona Formation, left valve, carapace, x47, GSC DD1, 43.2 m.
23. Hypotype, GSC 110268, Arkona Formation, right valve, carapace, x51, GSC DD1, 42.6 m.

Figure 24. *Quasillites* spp. indet.

24. Figured specimen, GSC 110269, Widder Formation, right valve, carapace, x61, GSC DD2, 26.5 m.

Figure 25. *Glyphella reticulata* Kesling and Chilman, 1978

25. Hypotype, GSC 110270, Bell Formation, right valve, carapace, x80, GSC DD1, 74.3 m.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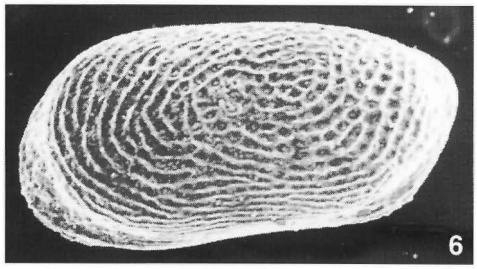
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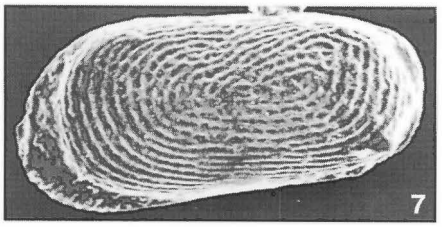
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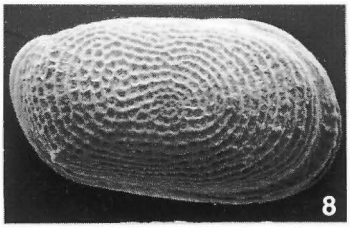
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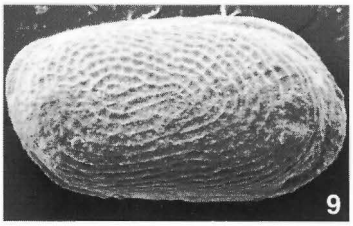
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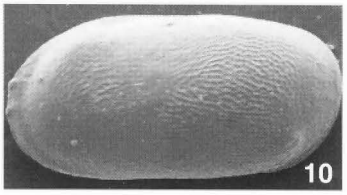
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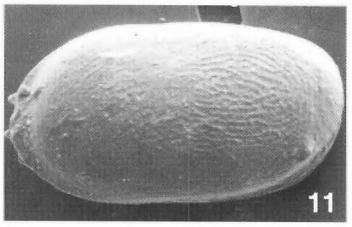
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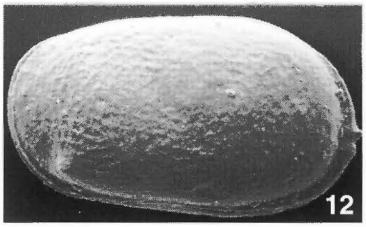
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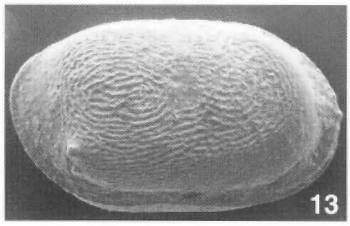
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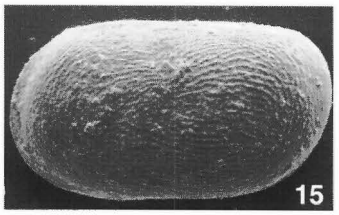
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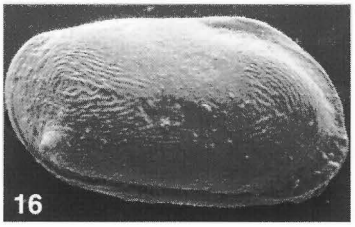
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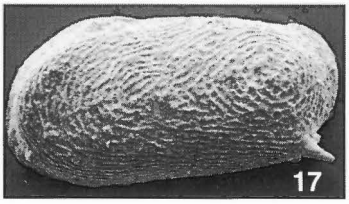
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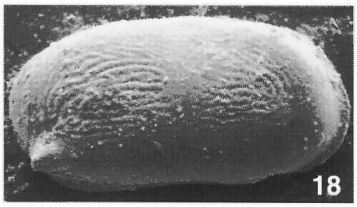
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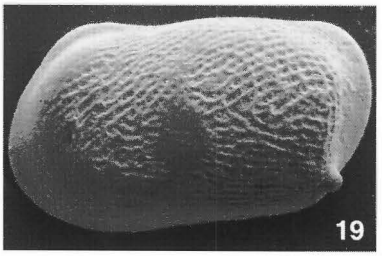
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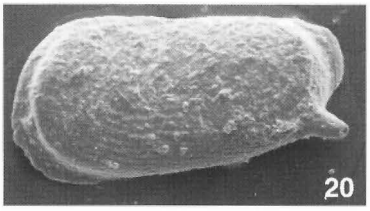
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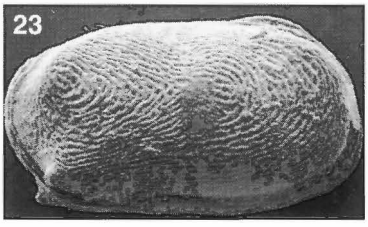
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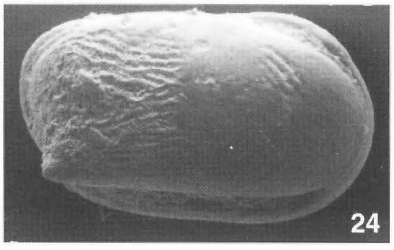
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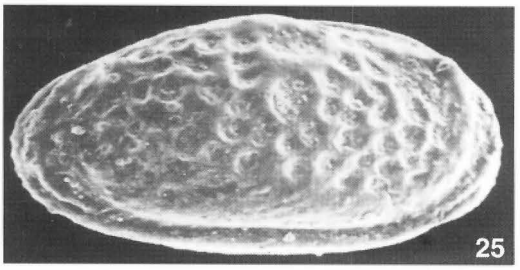
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PLATE 15

Figues 1-3. *Glyphella reticulata* Kesling and Chilman, 1978.

1. Hypotype, GSC 110271, Rockport Quarry Formation, left valve, carapace, x58, GSC DD1, 73.7 m.
2. Hypotype, GSC 110272, Rockport Quarry Formation, left valve, carapace, x57, GSC DD1, 73.7 m.
3. Hypotype, GSC 110273, Bell Formation, right valve, carapace, x70, GSC DD1, 74 m.

Figure 4. *Jenningsina catenulata* (Van Pelt), 1933.

4. Hypotype, GSC 110274, Bell Formation, right valve, carapace, x74 GSC DD1, 74.9 m.

Figure 5. *Bufina abbreviata* Peterson, 1966.

5. Hypotype, GSC 110275, Bell Formation, left valve, carapace, x51, GSC DD1, 72.8 m.

Figures 6-8. *Bythocyproidea eriensis* Stewart and Hendrix, 1945.

6. Hypotype, GSC 110276, Arkona Formation, right valve, carapace, x45, GSC DD2, 57.7 m.
7. Hypotype, GSC 110277, Arkona Formation, right valve, carapace, x49, GSC DD2, 57.7 m.
8. Hypotype, GSC 110278, Widder Formation, right valve, carapace, x58, GSC DD2, 25.9 m.

Figures 9-18. *Euglyphella sigmoidalis* (Jones), 1890.

9. Hypotype, GSC 110279, Arkona Formation, left valve, carapace, x50, GSC DD1, 33.7 m.
10. Hypotype, GSC 110280, Arkona Formation, dorsal view, carapace, x50, GSC DD1, 33.7 m.
11. Hypotype, GSC 110281, Arkona Formation, ventral, carapace, x50, GSC DD1, 33.7 m.
12. Hypotype, GSC 110282, Arkona Formation, left valve, carapace, x53, GSC DD1, 49.8 m.
13. Hypotype, GSC 110283, Arkona Formation, right valve, carapace, x56, GSC DD2, 58.9 m.
14. Hypotype, GSC 110284, Widder Formation, left valve, carapace, x63, GSC DD2, 12.1 m.
15. Hypotype, GSC 110285, Bell Formation, right valve, carapace, x50, GSC DD1, 74 m.
16. Hypotype, GSC 110286, Bell Formation, right valve, carapace, x54, GSC DD1, 72.8 m.
17. Hypotype, GSC 110287, Arkona Formation, left valve, carapace, x50, GSC DD1, 33.7 m.
18. Hypotype, GSC 110288, Arkona Formation, left valve, carapace, x53, GSC DD1, 47.7 m.

Figure 19. *Euglyphella projecta* Coryell and Malkin, 1936.

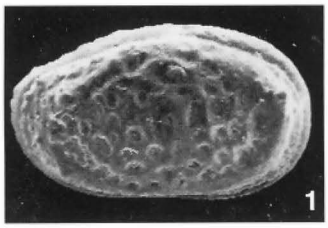
19. Hypotype, GSC 110289, Widder Formation, left valve, carapace, x60, GSC DD2, 28 m.

Figures 20-22. *Euglyphella lispa* Peterson, 1966.

20. Hypotype, GSC 110290, Ipperwash Formation, right valve, carapace, x69, GSC DD2, 6 m.
21. Hypotype, GSC 110291, Ipperwash Formation, left valve, carapace, x71, GSC DD2, 6 m.
22. Hypotype, GSC 110292, Ipperwash Formation, left valve, carapace, x78, GSC DD2, 8.7 m.

Figure 23. *Octonaria crescentiformis* Van Pelt, 1933.

23. Hypotype, GSC 110293, Rockport Quarry Formation, left valve, carapace, x50, GSC DD1, 63.5 m.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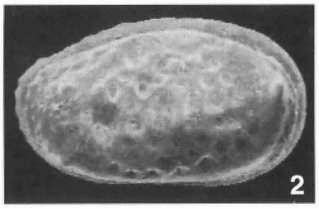
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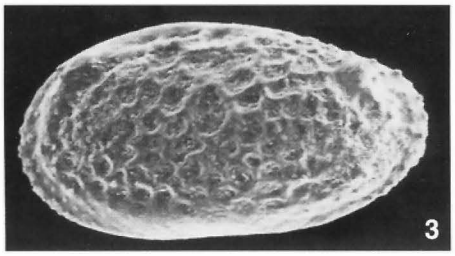
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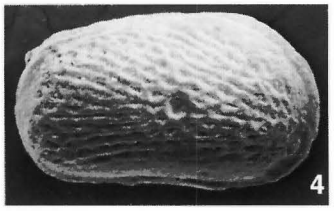
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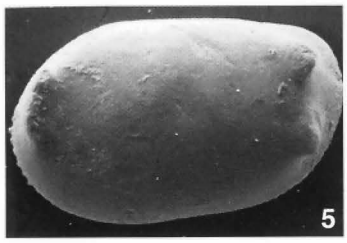
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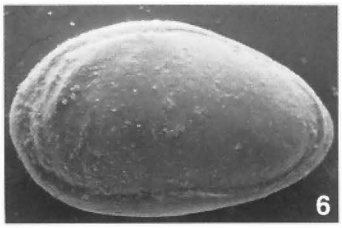
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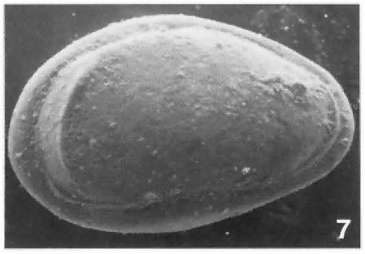
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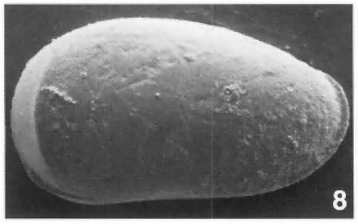
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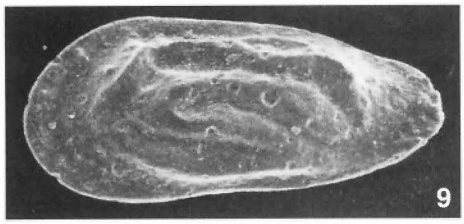
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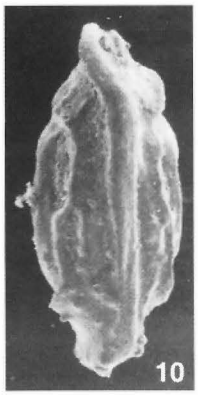
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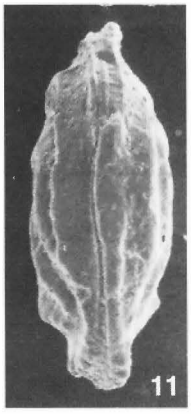
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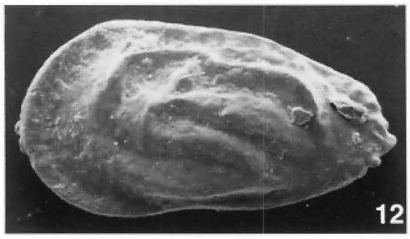
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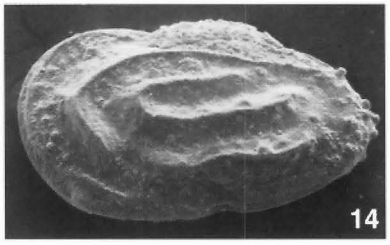
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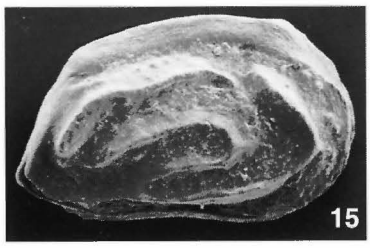
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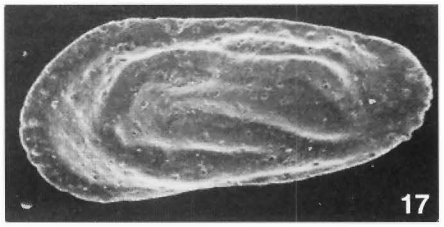
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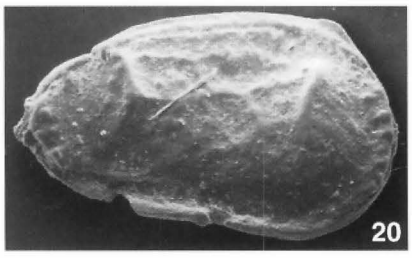
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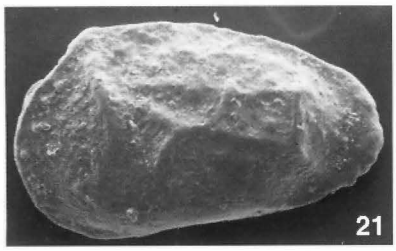
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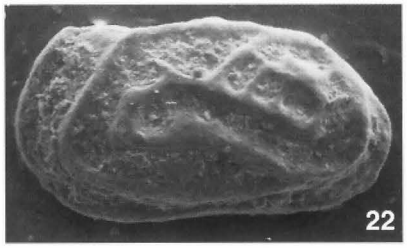
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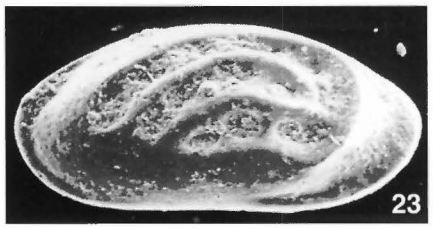
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PLATE 16

Figures 1, 2. *Octonaria crescentiformis* Van Pelt, 1933.

1. Hypotype, GSC 110294, Ipperwash Formation, right valve, carapace, x56, GSC DD2, 7.2 m.
2. Hypotype, GSC 110295, Bell Formation, left valve, carapace, x60, GSC DD1, 64.1 m.

Figures 3-10. *Octonaria laevilitata* Kesling and Kilgore, 1952.

3. Hypotype, GSC 110296, Arkona Formation, left valve, carapace, x51, GSC DD1, 49.8 m.
4. Hypotype, GSC 110297, Arkona Formation, left valve, carapace, x56, GSC DD1, 49.8 m.
5. Hypotype, GSC 110298, Arkona Formation, left valve, carapace, x53, GSC DD1, 49.8 m.
6. Hypotype, GSC 110299, Arkona Formation, left valve, carapace, x56, GSC DD1, 49.8 m.
7. Hypotype, GSC 110300, Arkona Formation, left valve, carapace, x50, GSC DD1, 37 m.
8. Hypotype, GSC 110301, Arkona Formation, left valve, carapace, x50, GSC DD1, 35.8 m.
9. Hypotype, GSC 110302, Arkona Formation, left valve, carapace, x50, GSC DD1, 35.8 m.
10. Hypotype, GSC 110303, Arkona Formation, left valve, carapace, x50, GSC DD1, 34 m.

Figures 11-20. *Octonaria quadricostata* Van Pelt, 1933.

11. Hypotype, GSC 110304, Arkona Formation, left valve, carapace, x47, GSC DD2, 58.9 m.
12. Hypotype, GSC 110305, Arkona Formation, right valve, carapace, x56, GSC DD1, 43.2 m.
13. Hypotype, GSC 110306, Arkona Formation, left valve, carapace, x53, GSC DD1, 43.5 m.
14. Hypotype, GSC 110307, Arkona Formation, right valve, carapace, x58, GSC DD1, 49.8 m.
15. Hypotype, GSC 110308, Hungry Hollow Formation, left valve, carapace, x60, GSC DD2, 29.8 m.
16. Hypotype, GSC 110309, Ipperwash Formation, left valve, carapace, x58, GSC DD2, 6.3 m.
17. Hypotype, GSC 110310, Ipperwash Formation, left valve, carapace, x55, GSC DD2, 6.9 m.
18. Hypotype, GSC 110311, Arkona Formation, right valve, carapace, x53, GSC DD1, 49.8 m.
19. Hypotype, GSC 110312, Arkona Formation, left valve, carapace, x54, GSC DD1, 42.6 m.
20. Hypotype, GSC 110313, Arkona Formation, left valve, carapace, x54, GSC DD1, 42.6 m.


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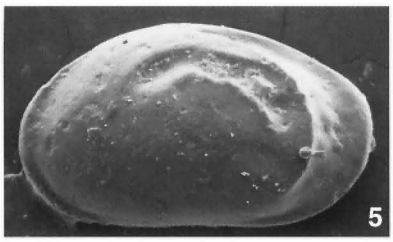
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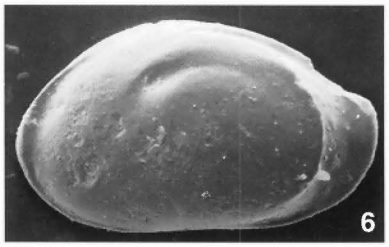
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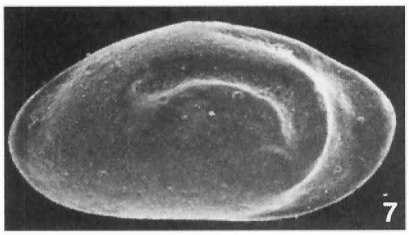
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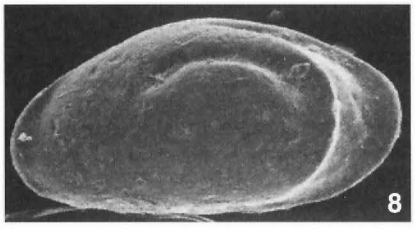
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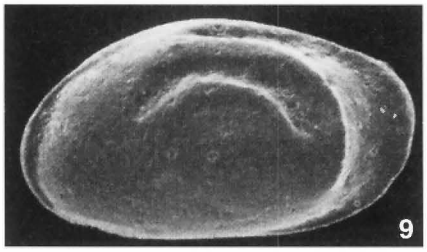
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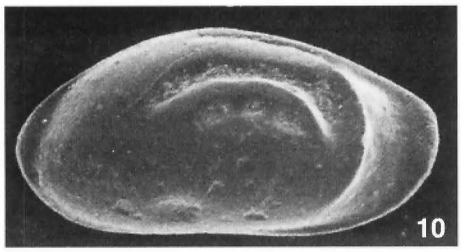
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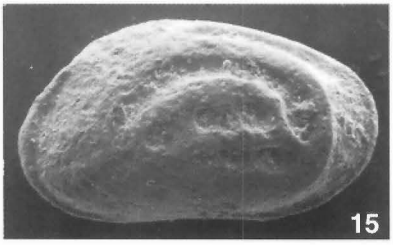
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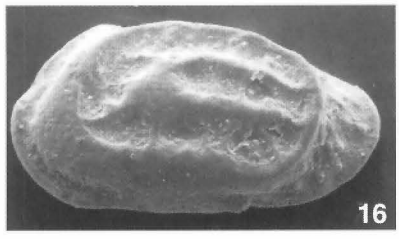
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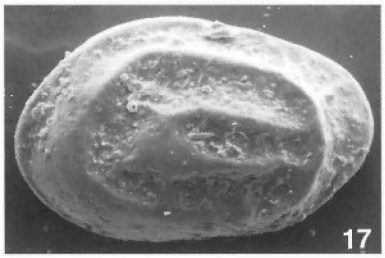
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